

Summary Tables on the Health Effects Data for Hazardous Air Pollutants (HAPs) - Group 1

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August 1995

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TECHNICAL APPROACH FOR DEVELOPING HEALTH EFFECTS PROFILES FOR HAPS

Scope of this document: The information contained in this document is not intended to be an exhaustive review of the scientific health effects literature on these chemicals. A summary of the relevant literature needed to make a decision as to whether additional testing is needed to understand the toxicity of these compounds following inhalation exposure is provided. The following criteria were used for the inclusion of studies, and the final summaries were reviewed by EPA:

- **Acute, Subchronic, and Chronic Systemic Noncancer Toxicity** - Since the main concern of this review is inhalation risk, only inhalation studies were reviewed. These studies usually provide no information on target organ toxicity and should be considered in the design of any testing protocol, these studies usually provide no information on the respiratory tract. In addition, the systemic dose of many compounds are affected by "first pass" effects at the portal of entry into the body making extrapolation of inhalation exposure problematic unless extensive pharmacokinetic data are available. An exception to this is dibutyl phthalate, which, because of its low vapor pressure, For this chemical, oral acute, subchronic, and chronic toxicity studies were reviewed and summarized.
 - **Reproductive Toxicity, Developmental Toxicity, Neurotoxicity and Carcinogenicity** - These endpoints were considered to be very important in evaluating the chemicals and for these endpoints, studies were reviewed regardless of the route of administration. In the evaluation of these endpoints, studies that were information because of inadequate study design or poor reporting of experimental procedures were not included in the tables.
 - **Pharmacokinetics** - For pharmacokinetics, only a summary statement was provided on the availability of pharmacokinetics data. The source of information obtained from secondary sources initially consulted for evaluation of the HAPS. The purpose of this pharmacokinetics summary statement was to indicate what sufficient information on the pharmacokinetics from the oral and inhalation routes to allow route-to-route extrapolation of toxicological studies.
 - **Genotoxicity** - This toxicological endpoint was not included in this document, but summarized separately in Waters, 1990 which is available in the docket for
 - **Adequacy of Data** - In the tables, adequacy is used to indicate if the conduct and design of the study are sufficient to meet the requirements of OPPT's Test Guideline that a study does not have to specifically meet the TSCA testing guideline, but it must have such qualities as sufficient numbers of test animals so that adequate and sufficient doses tested to define a dose-response relationship. When a study is indicated as inadequate, it is not implied that the study was necessarily poor in quality, but only that the study does not meet OPPT's test guidelines and that it would not provide the best basis for a risk assessment methodology.
- Identification of relevant scientific literature:** Under EPA's direction, SRC performed searches of the literature in a step-wise manner to save both time and expense and review secondary source health effect documents. EPA realizes that using secondary sources of information is not ideal, since the secondary source can miss important information. If information appeared to be missing or the interpretation was unclear, SRC obtained the original article for clarification. The second step was to conduct a scientific literature search, identify studies, obtain the original articles, and review these studies for inclusion in this document. The following details the strategy that was utilized:
- For this group of HAPS, EPA, IARC, or ATSDR health effects documents were identified and relevant data were extracted from these secondary sources and information was missing from the review documents, then the original article was consulted.
 - To obtain unpublished studies submitted to EPA under TSCA, the TSCATS data base was searched by CAS Registry number, the documents were retrieved and entered into the table.

- A current (1993) printout of the NTP Results Report (generated from NTP's CHEMTRACK data base) was reviewed to determine if there were completed studies or obtain the status of studies in progress or planned.
 - The *National Toxicology Program Review of Current DHHS, DOE, and EPA Research Related to Toxicology* Fiscal year 1993 was reviewed to determine the on these HAPs.
 - If few studies were identified, then searches were conducted on CAS ONLINE.
 - The EPA IRIS data sheets were reviewed to ascertain if additional data had been identified by the working group, and if studies were found, they were retrieved.
 - An up-date search of the open literature was conducted on TOXLINE from 3 years prior to the date of the review document used to initially obtain toxicity information, hard copies of relevant articles were retrieved, and the data from these articles were entered into the tables.
 - The literature searches were conducted in the latter part of 1992 and early in 1993; however, additional studies have been added through the middle of 1994 during the review process by EPA and SRC.
 - In general, translations of foreign articles were not available and few such articles are included in this document. Exceptions occurred when the translation was available through EPA archives or through EPA.
 - The tables were reviewed by a committee in EPA.
 - Representatives from NIOSH, OSHA, FDA, and NIEHS were consulted to determine if these organizations had any information on completed or on-going studies or any readily available database.
 - Representative trade organizations of the chemical industry were contacted to determine if they were aware of any on-going testing.
- Other related documents:** Two additional documents were prepared for the evaluation of the testing needs for these HAPs. One was a support document on physical environmental transport and persistence, consumer, environmental, and general population entitled *Exposure Profile for HAPs -- Group 1994*. The second was an evaluation of the genotoxic potential of these HAPs entitled *Genetic Activity Profiles of 110 Hazardous Air Pollutants Listed Under Title III of the Clean Air Act*. Both of these documents are included in the docket for this Test Rule.

Table of Toxicity Data for HAPs

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study Adequacy |
|---------------------|------------|---------------------------------|---------------|-------------------------|------------------|---------------------------------|--|--|---|---|
| Vinylidene chloride | 75-35-4 | Epidemiology (Cohort study) | Humans | Occupational | Inhalation | Less than 12 to over 120 months | Less than 500, 500-999, 1,000-1,999, to over 2,000 ppm | 28 to 32 in the three higher exposure groups and 50 in the lowest exposure group | There was no increase in lung cancers in exposed workers | Inadequate because cohort was small, there was no a for a latency period. |
| Vinylidene chloride | 75-35-4 | Epidemiology - Summary | | | | | | | | No adequate evidence regarding occurrence. |
| Vinylidene chloride | 75-35-4 | Acute toxicity | Rats and mice | Inhalation | Vapor | 6 hours | 0, 10, and 50 ppm | Males | Tissue damage and increased DNA replication were noted in kidneys of exposed mice. | Inadequate because few concentrations tested and the one sex. |
| Vinylidene chloride | 75-35-4 | Acute toxicity | Rats | Inhalation | Vapor | 4 hours | Not reported | 6/exposure group | LC ₅₀ = 32,000 ppm | Adequacy could not be determined. |
| Vinylidene chloride | 75-35-4 | Acute toxicity - Summary | | | | | | | | No adequate acute toxicity data. |
| Vinylidene chloride | 75-35-4 | Subchronic toxicity | Rats | Inhalation | Not reported | 90 days; continuous exposure | 0, 20, 61, 101, and 189 mg/m ³ (0, 5.04, 15.39, 25.47, and 47.67 ppm) | 15/treatment group, 30/4 control rats; sex not reported | Reduced weight gain and elevated liver alkaline phosphatase and serum glutamic-pyruvic transaminase activities were observed in high-exposure animals. Microscopic liver and kidney lesions were also observed only in high-dose animals. | This is a marginal adequate subacute toxicity study the number of the treated group is small. |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study Add. |
|---------------------|------------|--------------------------------------|-------------|------------------------------|------------------|------------------------------|--|---|---|---|
| Vinyldiene chloride | 75-35-4 | Subchronic toxicity | Guinea pigs | Inhalation | Not reported | 90 days; continuous exposure | 0,20, 61, 101, and 189 mg/m ³ | 15/treatment group, 314 control guinea pigs; sex not reported | Reduced weight gain and elevated liver alkaline phosphatase and serum glutamic-pyruvic transaminase activities were observed in high-exposure animals. No gross or histopathological changes were observed. | This is a marginally adequate subacute toxicity study. The number of the treated group is not reported. |
| Vinyldiene chloride | 75-35-4 | Subchronic toxicity - Summary | | Available data and kidney as | | | | | | |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study Add. |
|---------------------|------------|------------------|---------|-------------------------|------------------|--|--|-------------------------------|--|--|
| Vinyldiene chloride | 75-35-4 | Chronic toxicity | Rats | Inhalation | Vapor | 6 hours/day, 5 days/week, for 18 months | Nominal vapor concentrations of 0, 10, and 40 ppm (during first month; 0, 25, and 75 ppm (during remaining 17 months). Interim sacrifices occurred after 1, 6, and 12 months of exposure. A 6-month observation period followed the exposure period. | 85-86/sex/group | No treatment-related changes were observed with respect to appearance and demeanor, hematology, clinical chemistry, or urinalysis. Statistically significant increases in absolute liver (males) and kidney (females) weights were observed in the treated groups at 12 months. Organ weights returned to control level by 24 months. Increased cumulative incidences (all sacrifices) were observed in midzonal hepatic fatty changes (females; 75 ppm), chronic or acute tracheitis (males and females; 25 and 75 ppm), and chronic murine pneumonia (males and females; 25 and 75 ppm). Both hepatic and pulmonary effects were diminished after cessation of exposure. | This is an inadequate chronic toxicity study. NOAEL was not identified. |
| Vinyldiene chloride | 75-35-4 | Chronic toxicity | Mice | Inhalation | Whole-body | 4 hours/day, 4-5 days/week for 12 months | 0, 10, or 25 ppm (maximum tolerated exposure) | 30 to 120/sex/ group | Decreased body weight and kidney lesions occurred in high-dose animals; no effects were noted on survival. | An inadequate study of treatment which was sufficient to identify effects. |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study Add. |
|---------------------|------------|-----------------------------------|---------|-------------------------|------------------|--|-----------------|-------------------------------|--|--|
| Vinylidene chloride | 75-35-4 | Chronic toxicity | Mice | Inhalation | Not reported | 6 hours/day, 5 days/week for 12 months | 0 or 55 ppm | 16/sex/exposure | Two males died and had acute toxic hepatitis and tubular necrosis of the renal cortex. Decreased body weight and hepatocellular changes were noted in treated mice of both sexes, along with hepatic lesions including focal degeneration and necrosis, microfoci of mononuclear cells, and other. | Inadequate because of only one level and a low test animals for exposure period. |
| Vinylidene chloride | 75-35-4 | Chronic toxicity | Mice | Inhalation | Not reported | 6 hours/day, 5 days/week for 6 months | 0 or 55 ppm | 12/sex/exposure | Eleven died or were killed when moribund during the 18-month observation period. | Inadequate, because one exposure level used in a low number of test animals for exposure period. |
| Vinylidene chloride | 75-35-4 | Chronic toxicity | Rats | Inhalation | Not reported | 6 hours/day, 5 days/week for 10 months | 0 or 55 ppm | 15 or 16/sex/group | 20/30 died or were killed when moribund during the observation period, as compared to 13/32 deaths among controls. | Inadequate because of short exposure period and use of too many animals and treatment levels. |
| Vinylidene chloride | 75-35-4 | Chronic toxicity - Summary | | | | | | | | |

Available data
HEEP, 1986).

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study Add. |
|---------------------|------------|-----------------|---------|-------------------------|------------------|---|---|---|---|--|
| Vinyldiene chloride | 75-35-4 | Carcinogenicity | Rats | Oral | Drinking water | 2 years | Nominal drinking water concentrations of 0, 50, 100, and 200 ppm (calculated TWA doses of: 0, 7, 10, and 20 mg/kg/day for males; 0, 9, 14, and 30 mg/kg/day for females) | 48 rats/sex/group for treated groups; 80 rats/sex for control group | No significant treatment-related carcinogenic effect was observed. | This is an ade... |
| Vinyldiene chloride | 75-35-4 | Carcinogenicity | Rats | Inhalation | Vapor | 6 hours/day, 5 days/week, for 18 months | Nominal vapor concentrations of 0, 10, and 40 ppm (during first month); and 0, 25, and 75 ppm (during remaining 17 months). Interim sacrifices occurred after 1, 6, and 12 months of exposure. A 6-month observation period followed the exposure period. | 85-86/sex/group | No treatment-related significant increases in tumors were observed in males or females. | This is an ade... Exposure durat... in testing guid... however, anim... observed for li... |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study Add. |
|---------------------|------------|-----------------|---------|-------------------------|------------------|--|---|--------------------------------|---|--|
| Vinyldiene chloride | 75-35-4 | Carcinogenicity | Mice | Inhalation | Vapor | 4 hours/day, 4-5 days/week, for 52 weeks | 0, 10, and 25 ppm (acute toxic effects in 50, 100, and 200 ppm groups necessitated discontinuing treatment at these exposure concentrations). | 30-120 males and females/group | Significant increases in the incidence of renal adenocarcinomas (dose-related) and mammary carcinomas (not dose-related) were observed in males (25 ppm) and females (10 and 25 ppm), respectively. Pulmonary adenomas (not dose-related) were increased in males and females of both treated groups. | This is an inadequate basis of evidence for carcinogenicity due to the short duration; however, adequate to quaternize carcinogenesis since the results were positive. |
| Vinyldiene chloride | 75-35-4 | Carcinogenicity | Mice | Inhalation | Vapor | 6 hours/day, 5 days/week for 12 months | 0 or 55 ppm | 16/sex/exposure | Increased incidence of hepatic hemangiosarcomas and lung, skin, and liver cell tumors was noted, but the increases were not significantly different from that of controls. | Inadequate because of only one exposure level, and a low number of test animals used. |
| Vinyldiene chloride | 75-35-4 | Carcinogenicity | Mice | Inhalation | Vapor | 6 hours/day, 5 days/week for 1, 3, or 6 months | 0 or 55 ppm | 8 or 12/sex/ exposure | No significant increase in incidence of tumors was noted. | Inadequate, because one exposure was used in a low number of test animals for the period of time. |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study Add. |
|---------------------|------------|-----------------|---------|-------------------------|------------------|---|---|-------------------------------|---|--|
| Vinylidene chloride | 75-35-4 | Carcinogenicity | Rats | Inhalation | Vapor | 4 hours/day, 4-5 days/week for 52 weeks | 0, 10, 25, 50, or 100 ppm | 30/sex/exposure | Increased total number of rats with mammary tumors in 10 and 100 ppm groups and in total number of rats with fibromas and fibroadenomas in all groups, but a clear dose-response was not seen. Mammary carcinoma incidence in treated groups was not significantly different from that of controls. | Inadequate due to number of test and short exposure duration. |
| Vinylidene chloride | 75-35-4 | Carcinogenicity | Rats | Inhalation | Not reported | 4 hours/day, 4-5 days/week for 52 weeks | 0, 10, 25, 50, or 100 ppm | 30/sex/exposure | Life-time observations indicated incidences of brain tumors (gliomas, meningiomas, or ependymomas) were not significantly increased over control values. | Inadequate due to number of test and short exposure duration. |
| Vinylidene chloride | 75-35-4 | Carcinogenicity | Rats | Inhalation | Vapor | 6 hours/day, 5 days/week for 18 months | 0, 10, and 40 ppm for first 42 days, then 25 and 75 ppm for remainder | 85-86/sex/exposure | Increased incidence of mammary adenocarcinomas was noted at 25 ppm, but not at 75 ppm. | Inadequate due to short duration exposure. |
| Vinylidene chloride | 75-35-4 | Carcinogenicity | Rats | Inhalation | Not reported | 4 hours/day, 5 days/week for a total of 12 months | 0 and 200 ppm for 5 months, followed by 100 ppm for 7 months | 30-51/sex/group | A significant increase in tumor incidence was not seen. | Inadequate because of short exposure and use of too many animals and treatment levels. |
| Vinylidene chloride | 75-35-4 | Carcinogenicity | Rats | Inhalation | Not reported | 6 hours/day, 5 days/week for 12 months | 0 or 55 ppm | 16/sex/group | Increased incidence of hepatic hemangiosarcomas was noted, but was not significantly different from controls. | Inadequate because of short exposure and use of too many animals and treatment levels. |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study Add. |
|---------------------|------------|-----------------|---------|-------------------------|------------------|--|------------------------------------|-------------------------------|---|--|
| Vinylidene chloride | 75-35-4 | Carcinogenicity | Rats | Inhalation | Not reported | 6 hours/day, 5 days/week for 10 months | 0 or 55 ppm | 16/sex/group | A significant increase in tumor incidence was not seen. | Inadequate because MTD was not short exposure and use of too animals and treatment levels. |
| Vinylidene chloride | 75-35-4 | Carcinogenicity | Rats | Oral | Gavage | 5 days/week for 104 weeks | 0, 1, or 5 mg/kg/day in corn oil | 50/sex/group | No significant increase was noted in incidence of tumors with Bonferroni correction and life table analysis; a significantly increased incidence of lymphomas was seen in female mice without the statistical corrections. | Inadequate because MTD was not |
| Vinylidene chloride | 75-35-4 | Carcinogenicity | Mice | Oral | Gavage | 5 days/week for 104 weeks | 0, 2, and 10 mg/kg/day in corn oil | 50/sex/day | No significant increase was noted in incidence of tumors with Bonferroni correction and life table analysis; without these statistical corrections, there were increased incidences of adrenal pheochromocytomas, pancreatic islet-cell adenomas and carcinomas, testes interstitial cell tumors, and subcutaneous fibromas in males and pituitary adenomas in females. | Inadequate because MTD was not |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study Add. |
|---------------------|------------|-----------------|---------|-------------------------|--|--------------------------|---|--|--|---|
| Vinyldiene chloride | 75-35-4 | Carcinogenicity | Rats | Oral | Drinking water | 2 years | 0, 7, 10, or 20 mg/kg/day (males), 0, 9, 14, or 30 (females) | 48/sex/group; 80/sex in controls | Increased incidence of mammary gland fibroadenomas/adenofibromas in low dose, but no dose-response was noted. A high incidence of these tumors was seen in controls. Mammary carcinomas were not increased; increased incidence of total tumors was seen in males. | This is an ade carcinogenicity |
| Vinyldiene chloride | 85-35-4 | Carcinogenicity | Rats | Oral | Gavage | 52 weeks | 0, 5, 10, or 20 mg/kg/day in olive oil | 50/sex/group; 100/sex/group in controls | No significant increase in incidence of tumors was observed. | The study is incomplete because the number of acceptable animals used. |
| Vinyldiene chloride | 75-35-4 | Carcinogenicity | Rats | Oral | Gavage | 52 weeks | 0 or 0.5 mg/kg/day in olive oil | 50/sex/group; 77 to 82/sex/group in controls | No significant increase in incidence of tumors was observed. | The study was incomplete since only one group was used exposure duration too short. |
| Vinyldiene chloride | 75-35-4 | Carcinogenicity | Rats | Oral | Not reported, but appears to be gavage | 52 to 59 weeks | 0, 0.5, 5, 10 or 20 mg/kg/day in olive oil | 50/sex/group; 175/sex/group in controls | Incidence of brain tumors (gliomas, meningiomas, or ependymomas) were not significantly increased over controls. | Inadequate because short exposure |
| Vinyldiene chloride | 75-35-4 | Carcinogenicity | Rats | Oral | Gavage | 1 day/week for 120 weeks | 0 or 150 mg/kg on day 17 of gestation; from weaning, 0 or 50 mg/kg in olive oil | 64 to 90 males and females | Exposure in utero followed by weekly treatment from weaning did not lead to a significant increase in incidence of tumors. An increased prevalence of hyperplastic nodules was seen in the liver. | Inadequate study |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study Add. |
|---------------------|------------|----------------------------------|---------|-------------------------|---------------------|-------------------------------|--|---|---|---|
| Vinyldiene chloride | 75-35-4 | Carcinogenicity | Mice | Dermal | Topical application | 3 applications/ week for life | 0, 40, or 121 mg/application in acetone | 30 females/group | No local papillomas or carcinomas, nor significant increase in incidence of distant tumors. | Inadequate study |
| Vinyldiene chloride | 75-35-4 | Carcinogenicity - Summary | | Rats | Inhalation | Not reported | 23 hours/day, days 6-16 of gestation, and sacrificed on gestation day 20 | 0, 57, and 283 ppm (0, 230, and 1,142 mg/m ³) | 13 to 18 treated and 17 control litters, with tests conducted on 2/litter/exposure group, one male and one female. | Available data |
| Vinyldiene chloride | 75-35-4 | Developmental Neurotoxicity | | | | | | | Tests were conducted from postnatal day 1 to 12 or 14. No effects were observed in the following behavior tests: surface righting, pivoting, auditory startle, bar holding, righting in air, visual placing, swimming, physical maturation or activity tests. | This is an adequate developmental study. |
| Vinyldiene chloride | 75-35-4 | Neurotoxicity - Summary | | | | | | | | Some information inebriation) in concentrations behavioral studies. |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study Add. |
|---------------------|------------|------------------------|---------|-------------------------|------------------|----------------------------------|---|--|---|--|
| Vinyldiene chloride | 75-35-4 | Developmental toxicity | Rats | Inhalation | Not reported | 7 hours/day, gestation days 6-15 | 0, 20, 80, and 160 ppm (0, 80, 320, and 630 mg/m ³) | 30-44 presumed-pregnant females in treated groups; 20-47 in concurrent controls for each treated group | Maternal effects were decreased food consumption and decreased body weight gain (days 6-9) in the 2 highest exposure groups, and increased liver weight in the high-exposure group. Significant ($p < 0.05$) changes in the incidence of delayed skull and cervical vertebra ossification and wavy ribs were observed in the 80 and 160 ppm exposure groups. | This is an adequate developmental study. |
| Vinyldiene chloride | 75-35-4 | Developmental toxicity | Rabbits | Inhalation | Not reported | 7 hours/day, gestation days 6-15 | 0, 80, and 160 ppm (0, 320, and 630 mg/m ³) | 18-22 presumed-pregnant rabbits in treated groups, 16 in control group | Maternal effects were a significant decrease in body weight gain in the 160 ppm group, and increased liver weight at 80 ppm (statistically significant) and 160 ppm (not statistically significant) groups. There was an increased incidence of resorptions and skeletal alterations at 160 ppm. | This is a marginal adequate developmental toxicity study at the exposure level tested. |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study Add. |
|---------------------|------------|------------------------|---------|-------------------------|------------------|--|--|---|---|---|
| Vinyldiene chloride | 75-35-4 | Developmental toxicity | Rats | Inhalation | Not reported | 23 hours/day, days 6-16 of gestation, and sacrificed on gestation day 20 | 0, 15, 57, 300, and 449 ppm (0, 59, 230, 1190, and 1780 mg/m ³) | Approximately 20/ exposure group; 60 in the control group | Maternal toxicity was noted at all test levels (decreased body weight gain and food consumption); 25% maternal deaths occurred at 300 ppm and higher. There was an increased incidence of resorptions at 57 and 449 ppm, a decrease in number of fetuses/dam at 300 ppm, and a decrease in fetal weight at 57, 300, and 449 ppm. The incidence of lateral ventricle hydrocephalus increased at 15 and 57 ppm (statistically significant) and also at 300 ppm (not statistically significant). Also, a significant increase in incomplete sternbrae ossification was observed in the 15, 57, and 300 ppm groups. | This is a marginal adequate developmental toxicity study. NOAEC was identified for research and development toxicity. |
| Vinyldiene chloride | 75-35-4 | Developmental toxicity | Mice | Inhalation | Not reported | 23 hours/day, days 6-16 of gestation, and sacrificed on gestation day 17 | 0, 15, 30, 57, 144, and 300 ppm (0, 59, 120, 230, 571, and 1190 mg/m ³) 56 and 283 ppm (g.d. 8-20) | Approximately 20/ exposure group; 60 in the control group | Maternal mortality was 100% at 144 and 300 ppm, and decreased food consumption with decreased weight gain occurred in groups exposed to ≥ 30 ppm. There were no viable fetuses at 30 ppm or higher. Also, a significant increase in incomplete sternbrae ossification was observed in the 15 ppm group. | This is an inadequate developmental study because maternal toxic |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study Add. |
|---------------------|------------|----------------------------------|---------|-------------------------|------------------|---|--|------------------------------------|--|--|
| Vinyldiene chloride | 75-35-4 | Developmental toxicity | Mice | Inhalation | Not reported | 23 hours/day, gestation days (g.d.) 6-15, 8-15, 10-15, 12-15, 6-9, 9-12, 12-15, and 15-17 | 54 ppm (g.d. 6-15); 41, 54, and 74 ppm (g.d. 8-15); 41 ppm (g.d. 10-15); 54 ppm (g.d. 10-15 and 12-15); 56, 81, and 112 ppm (g.d. 6-9, 9-12, 12-15, and 15-17) | Not reported | Maternal toxicity (decreased weight gain) was evidence at these shorter exposure periods, but incidences of resorption were decreased. Developmental toxicity (increased incidences of cleft palate) was seen at 54 ppm levels, after treatment on gestation days 10-15 and 112-15. Delayed ossification, immature skin, and hematomas were also noted in various groups (not specified). | Inadequate study. Maternal toxicity occurred at near concentrations. |
| Vinyldiene chloride | 75-35-4 | Developmental toxicity - Summary | | | | | | | | Adequate or marginal developmental |
| Vinyldiene chloride | 75-35-4 | Reproductive toxicity | Rats | Inhalation | Not reported | 6 hours/day, 5 days/week, 11 weeks pre mating | 55 ppm; control group not reported | 12 males mated with 1 or 2 females | Male fertility and the incidence of pre- and post-implantation losses in females were not affected by treatment; however, there was a significant decrease in number of pregnancies. | This is an adequate study. dominant lethality does not fully affect the reproductive |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study Add. |
|---------------------|------------|---------------------------------|---------|-------------------------|------------------|--|---|---|---|---|
| Vinylidene chloride | 75-35-4 | Reproductive toxicity | Rats | Oral | Drinking water | 3-generation study. Parental animals were exposed for 100 days before mating (after raising one litter, they were mated again for a second litter) and F _{1b} rats were exposed after weaning. Exposure continued with the F ₂ and F ₃ animals. | Drinking water concentrations were 0, 50, 100, or 200 ppm | Parental: 10 males, 20 females in treated groups; 15 males, 30 females in the control group. Number of animals that were bred in subsequent generations ranged from 20 to 24 in the treated group | No clear dose-related reproductive effects were observed in any generation. | These concentrations caused mild dermal lesions in the I group. |
| Vinylidene chloride | 75-35-4 | Reproductive toxicity - Summary | | | | | | | | |
| Vinylidene chloride | 75-35-4 | Pharmacokinetics - Summary | | | | | | | | |

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Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study location/other information |
|-----------------------|------------|-------------------------------|---------|-------------------------|------------------|--------------|-----------------|---|----------------------------------|
| 1,1,2-Trichloroethane | 79-00-5 | Epidemiology (Cohort study) | Humans | Occupational | Not reported | Not reported | Not reported | 58 solvents/EDC plant workers (55 males and 3 females) and 38 contractors (sex not reported) | This inadde of th expo infor |
| 1,1,2-Trichloroethane | 79-00-5 | Epidemiology (Cohort study) | Humans | Occupational | Not reported | >1 year | Not reported | 270 men (28 known deceased); comparison groups were all white males in United States during 1944-1982 (28 deaths compared to 29.15 expected deaths), and all white males in Texas during 1965-1982 (24 deaths compared to 19.37 expected deaths). | This inadde of th expo infor |
| 1,1,2-Trichloroethane | 79-00-5 | Epidemiology - Summary | | | | | | No a locat (HE 1991 | |
| 1,1,2-Trichloroethane | 79-00-5 | Acute toxicity | Rats | Inhalation | Not specified | 6 hours | Not reported | Males; number not specified | This inadde repor and r |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study information/available evals |
|-----------------------|------------|----------------|---------|-------------------------|------------------|--------------|--|--------------------------------|--|
| 1,1,2-Trichloroethane | 79-00-5 | Acute toxicity | Rats | Inhalation | Vapor | 4 hours | 500 ppm; control group not reported | 6/group; sex not reported | This inad report and r |
| 1,1,2-Trichloroethane | 79-00-5 | Acute toxicity | Rats | Inhalation | Vapor | 8 hours | 1000, 2000 ppm; control group not reported | 6/group; sex not reported | This inad report and r |
| 1,1,2-Trichloroethane | 79-00-5 | Acute toxicity | Mice | Inhalation | | Not reported | 6 hours | Exposure levels not specified | LC ₅₀ =416 ppm. |
| 1,1,2-Trichloroethane | 79-00-5 | Acute toxicity | Mice | Inhalation | | Not reported | 3 hours | 800 ppm (control not reported) | Transient decreases in plasma triglycerides and ATP and an increase in liver triglycerides were observed. SGPT was also increased, and remained elevated through 20 hours post-dosing. |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study |
|-----------------------|------------|--------------------------|---------|-------------------------|------------------|------------------|---|-------------------------------|--|
| 1,1,2-Trichloroethane | 79-00-5 | Acute toxicity | Rats | Inhalation | Not reported | 7 hours | 100, 250, or 500 ppm (control group not reported) | Females; number not specified | Mortality in over 50% of rats in the 250 and 500 ppm groups was reported; necropsy of survivors revealed "marked" kidney and liver damage. At 100 ppm, all survived but were not microscopically examined. |
| 1,1,2-Trichloroethane | 79-00-5 | Acute toxicity | Rats | Inhalation | Not reported | 1, 2, or 4 hours | 250 ppm (control group not reported) | Females; number not specified | Liver and kidney necrosis were observed after a 4-hour exposure, but "apparently" not after 1- or 2-hour exposures. |
| 1,1,2-Trichloroethane | 79-00-5 | Acute toxicity | Rats | Inhalation | Vapor | 8 hours | Not specified | 6 females/group | 8-hour LC ₅₀ = 5.45 mg/L (1,000 ppm) (calculated by the moving average method). |
| 1,1,2-Trichloroethane | 79-00-5 | Acute toxicity | Rats | Inhalation | Vapor | 2 hours | 0 or 890 ppm | 5 males/group | No treatment-related effects were observed with respect to relative liver weight, serum glucose-6-phosphatase, SGPT, or SGOT. |
| 1,1,2-Trichloroethane | 79-00-5 | Acute toxicity - Summary | | | | | | | No a 1989 U.S. how and c |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Response | Study level |
|-----------------------|------------|---------------------|---------|-------------------------|------------------|------------------------------------|-----------------|---|--|
| 1,1,2-Trichloroethane | 79-00-5 | Subchronic toxicity | Rats | Inhalation | Vapor | 7 hours/day, 5 days/week, 6 months | 0 or 84 ppm | 12 males and 12 females/group (5 replacement rats were used because of deaths in the first month) | The mortality rate among exposed rats was 62% (18/29), although severe lung infection among some treated rats confounded the interpretation. "Major" damage occurred in liver, kidney, and lung in 55%, 52%, and 59% of exposed rats, compared to respective incidences of 46%, 25%, and 29% in controls. No notable differences with the control group were observed with respect to body length, liver and kidney weights, icterus index, liver fat, and blood cytology. |
| 1,1,2-Trichloroethane | 79-00-5 | Subchronic toxicity | Dogs | Inhalation | Vapor | 7 hours/day, 5 days/week, 6 months | 0 or 84 ppm | 1 male/group | No notable changes from pre-exposure values were observed with respect to bromsulfalein retention, serum phosphatase level, blood urea nitrogen, and blood cytology. A "light cloudy swelling" of the liver and "light" congestion of the lungs were noted at necropsy, while liver and kidney weights were not remarkable. |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study |
|-----------------------|------------|-------------------------------------|---------|-------------------------|------------------|----------------------------------|--|---|---|
| 1,1,2-Trichloroethane | 79-00-5 | Subchronic toxicity | Rats | Inhalation | Vapor | 6 months; frequency not reported | 0 or 100 ppm | 4 males, 7 females in the treated group; 5 males, 6 females in the control group. | Methyl weights as a percent of the controls were 93.0% and 94.1%, respectively. No other endpoints were reported. |
| 1,1,2-Trichloroethane | 79-00-5 | Subchronic toxicity | Mice | Oral | Gavage | 14 days | 0, 3.8, and 38 mg/kg | 8-12/sex/exposure group | Brain, thymic, and testicular weights were significantly increased in males at 38 mg/kg. |
| 1,1,2-Trichloroethane | 79-00-5 | Subchronic toxicity/ Immunotoxicity | Mice | Oral | Gavage | 14 days | 0, 3.8, and 38 mg/kg | 8-12/sex/exposure group | No alterations were noted in humoral or cell-mediated immune status. |
| 1,1,2-Trichloroethane | 79-00-5 | Subchronic toxicity | Mice | Oral | Drinking water | 90 days | 0, 4, 6, 46, and 305 mg/kg for males; 0, 3, 9, 44, and 384 mg/kg for females | 8-12/sex/exposure group | There was a concentration dependant reduction in weight gain in males and alterations in hepatic microsomal enzyme activities and serum enzyme levels in both sexes. A significant decrease in hematocrit and hemoglobin levels in females was noted. |
| 1,1,2-Trichloroethane | 79-00-5 | Subchronic toxicity/ Immunotoxicity | Mice | Oral | Drinking water | 90 days | 0, 4, 6, 46, and 305 mg/kg for males; 0, 3, 9, 44, and 384 mg/kg for females | 8-12/sex/exposure group | Cell-mediated immunity was unaltered in both sexes and humoral immune status was depressed in both sexes. Spleen lymphocyte responsiveness LPS (B cell mitogen) was significantly decreased in females. Macrophage function was depressed in males. |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study |
|-----------------------|------------|-------------------------------|--------------------------------|-------------------------|------------------|---|--|---|--|
| 1,1,2-Trichloroethane | 79-00-5 | Subchronic toxicity | Rats, guinea pigs, and rabbits | Inhalation | Not reported | 7 hours/day, 5 days/week, 6 months | 15 ppm (control group not reported) | Males and females; number not specified | No treatment-related effects were observed with respect to growth, mortality, organ weights, hematology, clinical chemistry, and histopathology. |
| 1,1,2-Trichloroethane | 79-00-5 | Subchronic toxicity - Summary | | | | | | | No available ATSDR Draft 9/93 |
| 1,1,2-Trichloroethane | 79-00-5 | Chronic toxicity - Summary | | | | | | | No chronic location (HE) 1991 |
| 1,1,2-Trichloroethane | 79-00-5 | Carcinogenicity | Mice | Oral | Gavage | 5 days/week, 78 weeks; 13-week post-treatment observation period. | 0, 150, or 300 mg/kg/day in corn oil for 8 weeks, then 0, 200, and 400 mg/kg/day for the remaining 70 weeks (TWA: 0, 195, and 390 mg/kg/day, calculated for 7 days/week); both vehicle and untreated control groups were used. | 50/sex | Hepatocellular carcinomas were increased in all treated groups ($p<0.01$); adrenal pheochromocytomas were present in 8/48 and 12/43 high-dose males and females, respectively, but in no other group. 50% mortality was achieved in each treated group during the period 58-90 weeks after initiation of dosing. |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study |
|-----------------------|------------|---------------------------|---------|-------------------------|----------------------------|---|--|---|--|
| 1,1,2-Trichloroethane | 79-00-5 | Carcinogenicity | Rats | Oral | Gavage | 5 days/week, 78 weeks; 35-week post-treatment observation period. | 0, 35, and 70 mg/kg/day in corn oil for 20 weeks, then 0, 50, and 100 mg/kg/day for the remaining 58 weeks (TWA: 0, 46, and 92 mg/kg/day calculated for 7 days/week; both vehicle and untreated control groups were used.) | 50/sex | No significant increase in tumor incidence was found in males or females. 50% mortality was achieved in each dose group during the period 96 to >105 weeks after initiation of dosing. |
| 1,1,2-Trichloroethane | 79-00-5 | Carcinogenicity - Summary | | | | | | | Carcinogenicity - Summary altho in the A re 1991 |
| 1,1,2-Trichloroethane | 79-00-5 | Neurotoxicity | Mice | Oral | Gavage (in water/corn oil) | Once | 100 mg/kg; other dose levels not specified | Male and female mice; number/group not reported | 128 mg/kg caused reversible "motor impairment" in 50% of treated mice (although neither this dose level nor higher dose levels were reported in the methods). The peak effect apparently occurred 5 minutes after dosing. Results of necropsy were not reported. "Taste aversion" (not elaborated in study report) occurred in the 100 mg/kg dose group. |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Site |
|-----------------------|------------|---|---------|-------------------------|------------------|-------------------------------|--------------------------------|-------------------------------|--|---|
| 1,1,2-Trichloroethane | 79-00-5 | Neurotoxicity | Mice | Inhalation | Vapor | 4 hours | Not reported | 10 males/group | 418 ppm of 1,1,2-trichloroethane was required for a 50% elevation in the clonic seizure threshold dose of penetraazole. | This by far the e tested failu suffici trichi U.S. 86-0 suggest |
| 1,1,2-Trichloroethane | 79-00-5 | Neurotoxicity - Summary | | | | | | | | No a trichi U.S. 86-0 |
| 1,1,2-Trichloroethane | 79-00-5 | Chernoff/Kavlock postnatal mouse screening test | Mice | Oral | Gavage | Once/day, gestation days 8-12 | 0 or 350 mg/kg/day in corn oil | 30 timed-pregnant mice | No treatment-related effects were observed with respect maternal toxicity, number of litters born, number of litters resorbed, number live pups/litter, number dead pups/litter, pup survival, live pup weight, and pup weight gain. | This screen not a evalua deve toxic malfor not s trichi U.S. 86-0 |
| 1,1,2-Trichloroethane | 79-00-5 | Developmental toxicity - Summary | | | | | | | | No a trichi U.S. 86-0 |
| 1,1,2-Trichloroethane | 79-00-5 | Reproductive toxicity - Summary | | | | | | | | No in trichi U.S. 86-0 |
| 1,1,2-Trichloroethane | 79-00-5 | Pharmacokinetics - Summary | | | | | | | | The huma (IAR radio ^{38}Cl -Othe excre other |

Table of Toxicity Data for HAPs (continued)

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Table of Toxicity Data for HAPs (continued)

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Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Response | Study |
|---------------------|------------|---------------------------------|---------|-------------------------|--|-----------------------------------|--|---|---|
| Methyl methacrylate | 80-62-6 | Epidemiology (Prevalence study) | Humans | Occupational | As dental laboratory technicians | 5 to 46 years (mean = 12.8 years) | 2200 to 5600 $\mu\text{g}/\text{m}^3$ (0.5 to 1.4 ppm) | 178 (146 males and 32 females) | Eight persons having a mean of 28 years of employment had simple pneumoconiosis. Mean values for percent predicted forced vital capacity (FVC) and forced expiratory volume (FEV) were reduced among male nonsmoker technicians compared to matched controls. Spirometric values decreased with increasing work-years. |
| Methyl methacrylate | 80-62-6 | Epidemiology (Prevalence study) | Humans | Occupational | As dental technicians | 3 to 29 years (mean = 15.6 years) | Not quantified | 87 male and female respondents (number/sex not reported); 15 illustrative cases participated in the clinical analysis | Subjective responses: dermatitis in 34% of persons; finger numbness, coldness, and whitening in 25%. Neurophysiological evaluation of 15 cases revealed decreased sensory conduction velocities in the fingers and occasional decreased sensory action potential amplitude associated with numbness, but not with dermatitis. |
| Methyl methacrylate | 80-62-6 | Epidemiology (Cohort study) | Humans | Occupational | As commercial producers of methyl methacrylate (MMA) and ethyl acrylate (EA) | 12, 36, or 39 years | Not quantified | 3 cohorts: 3934 men; 6548 men; 3381 men | No excess of mortality from cancer was seen in employees hired since the mid-1940s. Excess colon and rectal cancer were noted in employees exposed at least 3 years during the early 1940s to the highest levels of vapor-phase chemicals. |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study Response | Status |
|---------------------|------------|---|---------|-------------------------|-------------------------------------|----------------|------------------------------|-------------------------------|--|---|
| Methyl methacrylate | 80-62-6 | Epidemiology (Cohort study) | Humans | Occupational | As commercial producers of MMA | 17 to 23 years | 0.13 to 1.00 ppm, 8-hour TWA | 1561 men | No effect was noted on survival or cancer mortality. | Adequate |
| Methyl methacrylate | 80-62-6 | Epidemiology (Retrospective cohort study) | Humans | Occupational | During plastics manufacture | Up to 29 years | Not quantified | 1372 men | Total deaths or observed cancer deaths were not increased over the expected. The observed number of respiratory cancers was increased, but was not statistically significant. When grouped by year of hire, increased unspecified cancers and lymphatic cancers were noted. | Inadequate exposure information available |
| Methyl methacrylate | 80-62-6 | Epidemiology (Retrospective cohort study) | Humans | Occupational | As commercial producers of plastics | 1 to 12 years | Not quantified | 3934 males | Deaths from cancer of the respiratory tract, skin, stomach, liver, bladder, and kidneys were not higher than the expected U.S. mortality rates (1,528 observed; 1,869 expected). Deaths from cancer of the colon and rectum were significantly increased over the expected U.S. mortality rates (52 observed; 31.2 expected; SMR = 1.67, p <0.01); however, the majority of these cases do not appear to be related to length of exposure or total exposure. | Quan expo info avail |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Response | Study |
|---------------------|------------|---|---------|-------------------------|-----------------------------------|---|--|---|--|
| Methyl methacrylate | 80-62-6 | Epidemiology (Retrospective cohort study) | Humans | Occupational | During plastics manufacture | Up to 37 years | Not quantified | 6667 males at the Bristol plant; 3381 males at the Knoxville plant | Inadequate Quai expo unavail work expo acryl |
| | | | | | | | | At Bristol, exposure to ethyl acrylate was considered minor to exposure to methyl methacrylate. No statistically significant excess of site-specific cancers was noted. At Knoxville, cancers of the digestive tract, including colorectal cancer, were statistically significantly lower than predicted values. No association was seen between cumulative exposure "dose" and risk of respiratory cancer or digestive cancers including colorectal cancers. | |
| Methyl methacrylate | 80-62-6 | Epidemiology (Case report) | Humans | Occupational | Medical, while mixing bone cement | Not reported; short time period during mixing procedure | 3.8 to 7.8 mg/m ³ (0.9 to 1.9 ppm) | 1 operating room nurse | Corneal ulceration occurred on repeated occasions when the nurse worked under the same conditions. |
| Methyl methacrylate | 80-62-6 | Epidemiology - Summary | | | | | | | Epid expo |
| Methyl methacrylate | 80-62-6 | Acute toxicity | Rats | Inhalation | Vapor | 4 hours followed by a 14-day observation period | 0,1191,2159, 2220, 4055, 4446, 4632, or 16,000 ppm | 5/sex/group | Mortality occurred at 16,000 ppm. Rats gained less among higher exposure groups. Compound-related hypoactivity, dyspnea, and anesthesia were noted at all doses. |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study finding |
|---------------------|------------|----------------|---------|-------------------------|------------------|---|--|-------------------------------|--|-----------------------------------|
| Methyl methacrylate | 80-62-6 | Acute toxicity | Mice | Inhalation | Vapor | 4 hours followed by a 14-day observation period | 0, 1191, 2159, 2220, 4055, 4446, 4632, or 16,000 ppm | 5/sex/group | All high-dose mice died prior to the end of the study. Compound-related hypoactivity, dyspnea, and anesthesia were noted at all doses. No effect was evident on body weight. No abnormalities were apparent at necropsy. | Inadequate finding |
| Methyl methacrylate | 80-62-6 | Acute toxicity | Rats | Inhalation | Vapor | 4 hours | 1086 to 2715 ppm | 10 males/concentration | LC ₅₀ (within 24 hours post-exposure) was 1350 (1161-1570) ppm. No evidence of bleeding from any orifice was seen in any treated rats. Irritation of the eyes, nose, and respiratory tract, along with labored breathing, were apparent during treatment. | Inadequate finding |
| Methyl methacrylate | 80-62-6 | Acute toxicity | Rats | Inhalation | Vapor | 1, 2, 3, or 4 hours | 96.7 ± 0.41 ppm was measured chamber concentration | 4 males/group | No effects were seen at 1 hour of exposure. Interalveolar congestion and hemorrhage, pulmonary vasodilation and edema were noted in rats exposed for 2, 3, or 4 hours. | This limit |
| Methyl methacrylate | 80-62-6 | Acute toxicity | Rats | Inhalation | Vapor | 8 hours | 11.2, 13.4, 16.0, 20.1, 25.5, 26.5, 30.0, 31.3, 33.0, 35.6, and 192.3 mg/L (2734.8, 3272.0, 3906.9, 4908.1, 6226.7, 6470.8, 7325.5, 7642.9, 8058.0, 8692.9, and 22538.1 ppm) | 5-10/exposure level | Mortality was observed at 25.5 mg/L and higher, with an LC ₅₀ value of 30-33 mg/L; concentration-related clinical signs at 13.4 mg/L and higher included slight irritation to the upper respiratory tract, depression, increased urine flow, slight dyspnea, and mild cyanosis. | This acute for d LC ₅₀ |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study and i |
|---------------------------------|------------|---------------------|---------|-------------------------|------------------|---------------------------------------|----------------------------------|-------------------------------|--|---|
| Acute toxicity - Summary | | | | | | | | | | |
| Methyl methacrylate | 80-62-6 | Subchronic toxicity | Rats | Inhalation | Vapor | 6 hours/day, 5 days/week for 14 weeks | 0, 500, 1000, 2000, and 5000 ppm | 10/sex/group | Mortality occurred at 2000 ppm and higher. Decreased body weight and compound-related lesions of olfactory epithelium, kidney and liver were noted at 2000 ppm and above, and at ≥1000 ppm, females had malacia and gliosis of the brain. | Adequate finding |
| Methyl methacrylate | 80-62-6 | Subchronic toxicity | Mice | Inhalation | Vapor | 6 hours/day, 5 days/week for 14 weeks | 0, 500, 1000, 2000, and 5000 ppm | 10/sex/group | Mortality occurred at 2000 ppm and higher. Decreased body weight and metaplasia of the nasal epithelium occurred in all treatment groups, and compound-related lesions of the kidney, olfactory epithelium, and liver were noted at 2000 ppm and higher. | Adequate finding |
| Methyl methacrylate | 80-62-6 | Subchronic toxicity | Dogs | Inhalation | Vapor | 6 hours/day, 5 days/week for 3 months | 0, 100, and 400 ppm | 6 males/exposure level | No toxicity was observed. | This limit it only free-and bound too for group |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Response | Study |
|---------------------|------------|--|---------|-------------------------|------------------|--|---|--------------------------|---|
| Methyl methacrylate | 80-62-6 | Subchronic toxicity/ Immunotoxicity | Rats | Inhalation | Vapor | 8 hours/day for 3 and 6 months | 0 or 116 ppm | 50 males/group | This inad- only conc was |
| Methyl methacrylate | 80-62-6 | Subchronic toxicity | Rats | Inhalation | Vapor | 4 hours/day, 5 days/week for 32 days | 0, and 110 ± 5 ppm | Not reported | Exposed rats had significantly lower whole body (226.7 g vs. 213.7 g), lung (0.94 g vs. 0.84 g), and spleen (0.41 g vs. 0.39 g) weights than controls. In the 6-month study, mean body and popliteal fat pad weights and levels of serum protein, cholesterol, and blood urea nitrogen were significantly lower than controls. |
| Methyl methacrylate | 80-62-6 | Subchronic toxicity | Rats | Inhalation | Vapor | 6 hours/day, 5 days/week for 97 days | 0, 63, 125, 250, 500, or 1000 ppm | 10/sex/exposure level | No toxicity was observed. The exposure rats preened and huddled with their eyes closed. No effects were observed on survival, body or tissue weights, blood chemistry, gross metabolic performance, or spontaneous small intestinal motor activity as compared to controls. |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study |
|----------------------------|------------|--------------------------------------|---------|-------------------------|------------------|--|--|-------------------------------|---|---|
| Methyl methacrylate | | | | | | | | | | |
| Methyl methacrylate | 80-62-6 | Subchronic toxicity | Mice | Inhalation | Vapor | 6 hours/day, 5 days/week for 96 days | 0, 63, 125, 250, 500, or 1000 ppm | 10/sex/exposure level | Decreased body weight gain at 1000 ppm. | This an acute subchronic study |
| Methyl methacrylate | 80-62-6 | Subchronic toxicity - Summary | | Hamsters | Inhalation | Vapor | 6 hours/day, 5 days/week for 18 months | 0, 25, 100, and 400 ppm | 66/sex/exposure level | Tendency (statistical significance unknown) towards a shorter life expectancy in males at 400 ppm; otherwise, no toxicity was observed. |
| Methyl methacrylate | 80-62-6 | Chronic toxicity | Rats | Inhalation | Vapor | 2 years | 0, 25, 100, or 400 ppm | 44-49/sex/exposure level | The two highest exposure groups showed exposure related minimal to slight changes (including inflammation, degeneration, atrophy, and hyperplasia) in the olfactory epithelium of the anterior nasal cavity. There was also concentration dependant slight to moderate inflammation and hyperplasia in the respiratory epithelium of the anterior nasal cavity. | This an acute chronic study |
| Methyl methacrylate | 80-62-6 | Chronic toxicity | Rats | Inhalation | Vapor | 6 hours/day, 5 days/week for 104 weeks | 0, 25, 100, and 400 ppm | 70/sex/exposure level | Mild rhinitis was observed in treated rats; otherwise no toxicity was observed. | This acute chronic study |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study respi these |
|-----------------------------------|------------|------------------|----------|-------------------------|------------------|--|---|-------------------------------|--|
| Methyl methacrylate | 80-62-6 | Chronic toxicity | Rats | Inhalation | Vapor | 6 hours/day, 5 days/week for 102 weeks | Males: 0, 500, or 1000 ppm Females: 0, 250, or 500 ppm | 50/sex/group | Inadd a NC ident |
| Methyl methacrylate | 80-62-6 | Chronic toxicity | Mice | Inhalation | Vapor | 6 hours/day, 5 days/week for 102 weeks | 0, 500, or 1000 ppm | 50/sex/group | Inadd a NC ident |
| Methyl methacrylate | 80-62-6 | Chronic toxicity | | | | | | | |
| Chronic toxicity - Summary | | | | | | | | | |
| Methyl methacrylate | 80-62-6 | Carcinogenicity | Hamsters | Inhalation | Vapor | 6 hours/day, 5 days/week for 18 months | 0,25, 100, and 400 ppm | 66/sex/exposure level | No evidence of carcinogenicity was observed. |
| Methyl methacrylate | 80-62-6 | Carcinogenicity | Rats | Inhalation | Vapor | 6 hours/day, 5 days/week for 104 weeks | 0,25, 100, and 400 ppm | 70/sex/exposure level | No evidence of carcinogenicity was observed. |
| Methyl methacrylate | 80-62-6 | Carcinogenicity | Rats | Inhalation | Vapor | 6 hours/day, 5 days/week for 102 weeks | Males: 0, 500, or 1000 ppm Females: 0, 250, or 500 ppm | 50/sex/group | Noevidence of carcinogenicity was observed in either sex at any treatment level. |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study |
|---------------------|------------|----------------------------------|---------|-------------------------|------------------|--|---|-------------------------------|---|---|
| Methyl methacrylate | 80-62-6 | Carcinogenicity | Mice | Inhalation | Vapor | 6 hours/day, 5 days/week for 102 weeks | 0, 500, or 1000 ppm | 50/sex/group | No evidence of carcinogenicity was observed in either sex at any treatment level. | Adequate |
| Methyl methacrylate | 80-62-6 | Carcinogenicity - Summary | | | | | | | | |
| Methyl methacrylate | 80-62-6 | Neurotoxicity | Rats | Oral | Gravage | Daily for 21 days | 0 or 500 mg/kg/day | 30 males/group | Markedly impaired locomotor activity and learning; increased biogenic amine level in brain. | The study by laboratory information regarding test article limit endpoint. |
| Methyl methacrylate | 80-62-6 | Neurotoxicity | Rats | Inhalation | Vapor | 60 minutes | 0 or 400 ppm | Males (number not reported) | Depression in the multiple-unit electrical activity in the lateral hypothalamus and ventral hippocampus. | The study by laboratory information regarding test article limit endpoint. |
| Methyl methacrylate | 80-62-6 | Neurotoxicity - Summary | | | | | | | | |
| Methyl methacrylate | 80-62-6 | Developmental toxicity | Rats | Inhalation | Vapor | 2 hours/day, every 3 days on gestation days 6-18 | 0, 0.52, or 4.48 mg/L (0, 129.9, or 1093.9 ppm) | Not reported | No maternal toxicity was observed. Delayed ossification occurred in both treatment groups, and at 4.48 mg/L increased incidence of resorption occurred. | Inadequate exposure did not acceptably expose pregnant female rats every day. |
| Methyl methacrylate | 80-62-6 | Developmental toxicity | Rats | Inhalation | Vapor | 6 hours/day on gestation days 6-15 | 0, 99, 304, 1178, and 2028 ppm | 27/exposure level | Maternal toxicity was observed at all exposure levels, no developmental toxicity was observed. | This study developed toxicology no developmental effect level male. |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study |
|---------------------|------------|----------------------------------|------------------------|-------------------------|---------------------|------------------------------------|---|-------------------------------|--|--|
| Methyl methacrylate | 80-62-6 | Developmental toxicity | Rats | Inhalation | Vapor | 5 hours/day on gestation days 6-15 | 0, 100, 1000 ppm (Exp. I); 0, 25, 100, and 1000 ppm (Exp. II) | 30/exposure level | No maternal toxicity; increased number of early resorptions and incidence of retarded skeletal ossification at 1000 ppm. | This adeq deve toxic deve effec level mate Dam 5 hour of 6 |
| Methyl methacrylate | 80-62-6 | Developmental toxicity | Mice | Inhalation | Vapor | 6 hours/day on gestation days 4-13 | 0, 116, or 400 ppm | 18-38/exposure level | No maternal toxicity; decreased fetal body weights at 116 and 400 ppm. | This inadve became did n later organ two tested NOA ident deve toxic |
| Methyl methacrylate | 80-62-6 | Embryotoxicity test | White leghorn chickens | Injection into eggs | Solution in acetone | Single injection | 0,2,3,4,5,9, 18, and 36 μmol/egg | 20-30/dose level | ED ₅₀ (embryotoxicity) was 22.0 (confidence limits = 9.0 to 56.0) μmol/egg. Malformations, including eye, neck, back, wings, and legs were observed, but a dose-response relationship was not seen. | This stand deve |
| Methyl methacrylate | 80-62-6 | Developmental toxicity - Summary | | | | | | | | Adequate (TSC) |
| Methyl methacrylate | 80-62-6 | Reproductive toxicity - Summary | | | | | | | | No detailed location |
| Methyl methacrylate | 80-62-6 | Pharmacokinetics - Summary | | | | | | | | Pharm expo |

Table of Toxicity Data for HAPs (continued)

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Table of Toxicity Data for HAPs (continued)

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Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study |
|--------------------|------------|---|---------|-------------------------|------------------|----------------------|---|-------------------------------|---|
| Phthalic anhydride | 85-44-9 | Clinical evaluation | Human | Inhalation | Fumes | 8 months to 25 years | Minimal (16 workers) to high (1 worker) estimated exposures | 20 males total | 4 Workers had elevated total antibody binding to phthalic anhydride-human serum albumin (PA-HSA) and elevated specific IgG and IgE to PA-HSA. The worker with high exposure had allergic rhinitis associated with phthalic anhydride. |
| Phthalic anhydride | 85-44-9 | Clinical evaluation | Human | Inhalation | Dust | Not reported | Not reported | 2 males | Ocular itching, rhinorrhea, chest tightness, and wheezing which stopped following removal from exposure. There was an increase in serum-specific IgE to PA-HSA in both workers. |
| Phthalic anhydride | 85-44-9 | Epidemiology (Cross-sectional health study) | Humans | Not reported | Not reported | Not reported | Not reported | 91 males and 14 females | No potential for allergenic effects were observed as screened for by an increase in eosinophils. |
| Phthalic anhydride | 85-44-9 | Epidemiology (Cross-sectional health study) | Humans | Not reported | Not reported | Not reported | Not reported | 129 males and 10 females | No effects were observed in pulmonary function, renal function, urinalysis, or immunological findings. |
| Phthalic anhydride | 85-44-9 | Epidemiology - Summary | | | | | | | Severe anhy |
| Phthalic anhydride | 85-44-9 | Acute toxicity - Summary | | | | | | | Not d located |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Site |
|--------------------|------------|-------------------------------|---------|-------------------------|------------------|---|---|---|---|--|
| Phthalic anhydride | 85-44-9 | Subchronic toxicity | Rats | Inhalation | Vapor | 6 hours/day for 5 days, rested for 3 weeks, then challenged with a single 6 hour exposure | 500 µg/m ³ (0.08 ppm) | 20/exposure level | Increased numbers of hemorrhagic foci were observed, indicative of respiratory sensitization. | This adeq toxic beca endp evali one was Additi toxic |
| Phthalic anhydride | 85-44-9 | Subchronic toxicity - Summary | | | | | | | | |
| Phthalic anhydride | 85-44-9 | Chronic toxicity - Summary | | | | | | | | |
| Phthalic anhydride | 85-44-9 | Carcinogenicity | Rats | Oral | Diet | 105 weeks | 0, 7500 or 15,000 ppm | 50/sex/group; 20 matched controls of each sex | Under the conditions of the assay, phthalic anhydride was not carcinogenic. There was, however, a significant trend in alveolar/bronchiolar adenomas in female rats | This oral |
| Phthalic anhydride | 85-44-9 | Carcinogenicity | Mice | Oral | Diet | 72 weeks | 12,500 or 25,000 ppm for males and 6250 or 12,500 ppm for females | 50/sex/group; 20 matched controls of each sex | Under the conditions of the assay, phthalic anhydride was not carcinogenic. | This oral |
| Phthalic anhydride | 85-44-9 | Carcinogenicity - Summary | | | | | | | | No d inhal is av |
| Phthalic anhydride | 85-44-9 | Neurotoxicity - Summary | | | | | | | | No d (Cle) |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study |
|--------------------|------------|---|---------|-------------------------|------------------|-------------------------------------|--|-------------------------------|--|
| Phthalic anhydride | 85-44-9 | Developmental toxicity | Mice | Injection | I.P. | Administered on gestation days 8-10 | 0; Treatment values not reported; highest dose was reportedly within 95% confidence limits of the calculated LD _{0/0} . | Not reported | The compound was considered to be a "low hazard" with regard to teratogenicity. This adequate developmental toxicity report because insufficient information was available. |
| Phthalic anhydride | 85-44-9 | Developmental toxicity - Summary | | | | | | | Additive phthalic anhydride reference dose for phthalic anhydride (85-44-9). Prepared by Clement Associates, Inc. for Environmental Criteria and Assessment Office. (1990d). |
| Phthalic anhydride | 85-44-9 | Reproductive toxicity - Summary | | | | | | | No data available (Clement et al., 1990d). |
| Phthalic anhydride | 85-44-9 | Pharmacokinetics - Summary | | | | | | | Limited pharmacokinetic data available (Clement et al., 1990d). |

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Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study |
|---------------|------------|-------------------------------|---------|-------------------------|------------------|---|--|-------------------------------|--|---|
| Naphthalene | 91-20-3 | Epidemiology (Cohort study) | Humans | Inhalation | Fumes or dust | ≤5 years | Not reported | 21 workers | Cataracts developed in 8/21 of the workers; 7/8 of the affected workers were less than 50 years old. | This inadmissible epidemic became part of the study because of lack of exposure information. |
| Naphthalene | 91-20-3 | Epidemiology (Case study) | Humans | Inhalation | Vapor | Exposed to fumes from hundreds of mothballs for "several years" in the home | Air samples collected indicated 20 ppb, but levels were probably higher with fresh mothballs | 8 adults and 1 child | Vomiting and abdominal pain were observed in all individuals, and anemia was reported in "several" individuals. | This inadmissible epidemic was observed in all individuals, and anemia was reported in "several" individuals. |
| Naphthalene | 91-20-3 | Epidemiology (Case study) | Humans | Oral | Not reported | ≥3 months; frequency not reported | Not reported | 1 pregnant 26-year old | Maternal hemolytic anemia; newborn hemolytic anemia, jaundice, lethargy, and anorexia were noted. | This inadmissible epidemic was observed in all individuals, and anemia was reported in "several" individuals. |
| Naphthalene | 91-20-3 | Epidemiology - Summary | | | | | | No animal studies | | No animal studies |
| Naphthalene | 91-20-3 | Acute toxicity | Rats | Inhalation | Vapor | 4 hours, then observed for 14 days | 77.7 ppm | 5/sex | No mortalities were observed. Lacrimation, mouth breathing, and closed eyes were the only clinical signs. No gross pathologic lesions were observed. | An inadmissible range of studies were performed. |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study (TSC) |
|--------------------|------------|--------------------------------------|---------|-------------------------|------------------|--|-------------------|-------------------------------|--|---|
| Naphthalene | | | | | | | | | | |
| | 91-20-3 | Acute toxicity - Summary | | | | | | | | Adequate (TSC) |
| Naphthalene | 91-20-3 | Repeated dose study | Mice | Inhalation | Vapor | 6 hours/day, 5 days/week, for 2 weeks | 0, 10, or 30 ppm | 5/sex/group | No treatment-related effects were noted on survival, body weight or clinical signs. Small but not significant alterations were noted in hematologic parameters among high-exposure females (increased leukocytes, decreased hemoglobin and mean cell volume) but not in males. | The inadequate evaluation (subchronic study) because insufficiencies in study duration were |
| Naphthalene | | | | | | | | | | |
| | 91-20-3 | Subchronic toxicity - Summary | | | | | | | | No adequate (NTSC) study were |
| Naphthalene | 91-20-3 | Chronic toxicity | Mice | Inhalation | Vapor | 6 hours/day, 5 days/week for 104 weeks | 0, 10, and 30 ppm | 75/sex/exposure level | Chronic inflammation in nose and lungs at 10 and 30 ppm; metaplasia of olfactory epithelium and hyperplasia of respiratory epithelium in nose at 10 and 30 ppm. | This chro study |
| Naphthalene | | | | | | | | | | |
| | 91-20-3 | Chronic toxicity - Summary | | | | | | | | An adequate (NTSC) study |
| Naphthalene | 91-20-3 | Carcinogenicity | Mice | Inhalation | Vapor | 6 hours/day, 5 days/week for 104 weeks | 0, 10, and 30 ppm | 75/sex/exposure level | Incidence of pulmonary alveolar/bronchiolar adenomas was increased in females at 30 ppm. | This carcinogenic study |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study |
|---------------|------------|-----------------------------|---------|-------------------------|------------------|---------------------------------------|--------------------|-------------------------------|---|
| Naphthalene | 91-20-3 | Carcinogenicity Toxicity | Mice | Inhalation | Vapor | 6 hours/day, 5 days/week for 26 weeks | 0, 10, and 30 ppm | 30 females/exposure level | Increased adenomas per tumor-bearing mouse lung at 10 and 30 ppm, but the number of tumors in tumor-bearing control mice was significantly lower than the pooled controls of 6 other concurrent studies on other chemicals. |
| Naphthalene | 91-20-3 | Carcinogenicity - Summary | | | | | | | An animal study by NTP in 1992. |
| Naphthalene | 91-20-3 | Neurotoxicity - Summary | | | | | | | No data available from 1989 subchronic study by OPP. |
| Naphthalene | 91-20-3 | Developmental toxicity | Mice | Oral | Gavage | Daily on gestation days 7-14 | 0 or 300 mg/kg/day | 50/exposure group | Reduced body weight gain and increased mortality were observed in dams. The number of live young at birth was decreased. |
| Naphthalene | | | | | | | | | This study is inadequate. The examination of young only was not performed. |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study |
|---------------|------------|------------------------|---------|-------------------------|------------------|------------------------------|-------------------------------|-------------------------------|---|
| Naphthalene | 91-20-3 | Developmental toxicity | Rats | Oral | Gavage | Daily on gestation days 6-15 | 0, 50, 150, and 450 mg/kg/day | 25-26/exposure group | Transient clinical signs (lethargy, slow respiration, prone body posture, and rooting behavior), transient reduced food and water consumption, and reduced body weight gain were observed in all dams. Significantly decreased body weight gain was seen at 150 mg/kg/day. No significant changes in fetal growth, viability, or morphological development were observed. |
| Naphthalene | 91-20-3 | Developmental toxicity | Rabbits | Oral | Gavage | Daily on gestation days 6-18 | 0, 40, 200, and 400 mg/kg/day | 18/exposure group | Clinical signs (decreased activity, dyspnea, cyanosis, ocular and/or nasal discharge, and salivation) were observed in the dams from the 200 and 400 mg/kg/day groups. No effects were seen on maternal survival, body weights or body weight gain. No effects were noted on reproductive parameters. No congenital abnormalities were observed. |
| Naphthalene | 91-20-3 | Developmental toxicity | Rabbits | Oral | Gavage | Daily on gestation days 6-19 | 0, 20, 80, and 120 mg/kg/day | 25 to 27 females/group | No effects were reported in does or fetuses. |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study in 2A |
|---|------------|--|---------|-------------------------|------------------|------------------------------|--|-------------------------------|--|-----------------------------|
| Developmental toxicity - Summary | | | | | | | | | | |
| Naphthalene | 91-20-3 | Reproductive toxicity | Mice | Oral | Gavage | Daily for 14 days | 0 or 267 mg/kg/day | 40 to 112/sex/group | No effects on testicular weights. | Inadequate |
| Naphthalene | 91-20-3 | Reproductive toxicity | Mice | Oral | Gavage | Daily for 90 days | 0 or 133 mg/kg/day | 40 to 112/sex/group | No effects on testicular weights. | Inadequate |
| Naphthalene | 91-20-3 | Short-term reproductive toxicity | Mice | Oral | Gavage | Daily on gestation days 7-14 | 0 or 300 (predetermined MTD) mg/kg/day | 50 sperm-positive females | Decreased maternal survival and decreased body weight gain. Significantly decreased number of live pups and litter weight, but not significantly decreased weight/pup. | Adequate reproductive term |
| Naphthalene | 91-20-3 | Reproductive toxicity - Summary | | | | | | | | Data |
| Naphthalene | 91-20-3 | Pharmacokinetics - Summary | | | | | | | | Limited and early 1989 pulm |

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Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study location |
|---------------|------------|---|---------|-------------------------|------------------|--|--|-------------------------------|------------------|
| 1,1'-Biphenyl | 92-52-4 | Epidemiology (Case studies) | Humans | Inhalation | Occupational | Approximately 100 days/year for 11 years | 4.4 to 128 mg/m ³ (0.7 to 20.3 ppm) | 33 (32 men and 1 woman) | Inadequate (HEI) |
| 1,1'-Biphenyl | 92-52-4 | Epidemiology - Summary | | | | | | | |
| 1,1'-Biphenyl | 92-52-4 | Acute toxicity | Rats | Inhalation | Vapor | 6 hours | 0.2 ppm | 6 males | Inadequate (HEI) |
| 1,1'-Biphenyl | 92-52-4 | Acute toxicity | Mice | Inhalation | Vapor | 4 hours | 14, 38, and 43 ppm | 10/sex/group | Inadequate (HEI) |
| 1,1'-Biphenyl | 92-52-4 | Acute toxicity - Summary | | | | | | | |
| 1,1'-Biphenyl | 92-52-4 | Subchronic toxicity (range finding) | Mice | Inhalation | Vapor | 7 hours/day, 5 days/week for 2 weeks | 0, 24, 80, and 54, 75 ppm (mean measured) | 10/sex/group | Adequate (HEI) |
| 1,1'-Biphenyl | 92-52-4 | Hyperactivity during exposure; no histopathological effects in lungs, trachea, liver, kidneys, or spleen. | | | | | | | |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study |
|---------------|------------|--------------------------------------|---------|-------------------------|------------------|---------------------------------------|--|-------------------------------|--|---------------------------------|
| 1,1'-Biphenyl | 92-52-4 | Subchronic toxicity | Mice | Inhalation | Vapor | 7 hours/day, 5 days/week for 13 weeks | 0, 25, and 50 ppm (nominal) | 50/sex/group | Treatment-related hyperplasia of tracheal epithelia was noted, along with congestion of the lung, liver, and kidney. | Inadeq only were NOA ident (HE) |
| 1,1'-Biphenyl | 92-52-4 | Subchronic toxicity - Summary | | | | | | | | |
| 1,1'-Biphenyl | 92-52-4 | Chronic toxicity - Summary | | | | | | | | |
| 1,1'-Biphenyl | 92-52-4 | Carcinogenicity | Rats | Oral | Diet | 700 days | 0, 0.001, 0.005, 0.01, 0.05, 0.1, 0.5, or 1% | 15/sex/dose group | Histopathological examination revealed no treatment related incidence of tumors. | Inadeq insuff of test used |
| 1,1'-Biphenyl | 92-52-4 | Carcinogenicity - Summary | | | | | | | | |
| 1,1'-Biphenyl | 92-52-4 | Neurotoxicity - Summary | | | | | | | | |
| | | | | | | | | | | Carc adeq CHE |
| | | | | | | | | | | Neuro 1984 |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Status |
|---------------|------------|------------------------------------|---------|-------------------------|------------------|--|--------------------------------------|-------------------------------|--|
| 1,1'-Biphenyl | 92-52-4 | Developmental toxicity | Rats | Oral | Gavage | Gestation days 6-15 | 0, 125, 250, 500, or 1000 mg/kg/day | 18 to 20 mated females/group | Maternal and embryotoxicity occurred at 1000 mg/kg/day (mortality of 5 dams during the treatment period, preceded by a sharp reduction in body weight and diarrhea), increased resorptions, and 5 dams were found not to be pregnant, possibly due to interference with implantation). No effects were noted on dams or development of offspring in the other test groups. |
| 1,1'-Biphenyl | 92-52-4 | Developmental toxicity - Summary | | | | | | | Deve (HEI) cond |
| 1,1'-Biphenyl | 92-52-4 | 3-Generation reproductive toxicity | Rats | Oral | Feeding | F ₀ parents from age 4 months through mating, gestation, lactation; continuous dosing of F ₁ and F ₂ parent generations | 0, 0.01, 0.1, or 1.0% dietary levels | 3 males; 9 females/group | Decreased fertility and litter size of high-dose females and decreased growth rate of pups in the high-dose group. There was no evidence of cumulative toxicity over 3 generations. |
| 1,1'-Biphenyl | 92-52-4 | Reproductive toxicity - Summary | | | | | | | Repr data 1992 |
| 1,1'-Biphenyl | 92-52-4 | Pharmacokinetics - Summary | | | | | | | Pharm (HEI) |

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Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study |
|------------------------|------------|--|---------|-------------------------|---------------------------------------|------------|--|-------------------------------|---|--|
| Ethylbenzene | 100-41-4 | Epidemiology (Cohort study) | Humans | Occupational | Commercial production of ethylbenzene | 29 years | Not reported | 200 males | No effects were noted on complete blood count, hemoglobin concentration, or blood chemistry values. Urinalysis indicated mandelic acid, phenol, and mercapturates were within maximum allowable concentration (MAC) range. | Marg Quan expo not r |
| Ethylbenzene | 100-41-4 | Epidemiology (Controlled human experimental) | Humans | Inhalation | Vapor | 8 hours | 100 ppm | 18 volunteers | There were no adverse health effects. Only traces of ethylbenzene were found in expired air and only negligible amounts were excreted in the urine; at unspecified higher concentrations, irritation of the eyes and respiratory tract occurred and subjects developed headaches and fatigue. | The inadq it wa as a biot study ethyl thus, num were |
| Ethylbenzene | 100-41-4 | Epidemiology - Summary | | | | | | | | |
| Ethylbenzene | 100-41-4 | Acute toxicity | Rats | Inhalation | Vapor | 4 hours | 2000, 4000, and 8000 ppm, and saturated vapors | 6/group | Mortalities were 0/6, 3/6, 6/6, and 6/6 for 2000 ppm, 4000 ppm, 8000 ppm, and saturated vapors, respectively. | This adeq toxic becau sex v |
| Ethylbenzene | 100-41-4 | Acute toxicity | Mice | Inhalation | Vapor | 30 minutes | 410, 860, 1875, 3970, and 9640 ppm | 4 males/group | Decrease in respiratory rate was observed at all concentrations and sedation occurred at 9640 ppm. | Inadd group smal effic respili |
| Ethylbenzene | 100-41-4 | Acute toxicity - Summary | | | | | | | | |
| Additional information | | | | | | | | | | |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Response | Study |
|---------------|------------|---------------------|-------------------------|-------------------------|------------------|---|----------------------------|--|---|
| Ethylbenzene | 100-41-4 | Subchronic toxicity | Rats | Inhalation | Vapor | 6 hours/day, 5 days/week for 2, 5, 9, or 16 weeks | 0, 50, 300, and 600 ppm | 5 males/group | No effect was noted on weight gain. Increased relative kidney weight was noted at 2 and 9 weeks in high-dose animals, but not at 16 weeks. Other effects noted at 600 ppm included changes in hepatocyte ultrastructure, but no necrosis; altered liver and kidney metabolizing enzymes; slightly increased excretion of kidney CSH, but no change in hepatic glutathione. |
| Ethylbenzene | 100-41-4 | Short-term exposure | Rats, mice, and rabbits | Inhalation | Vapor | 6 hours/day for 4 days | 0, 400, 1200, and 2400 ppm | 5 male rats and mice and 4 male rabbits/exposure level | Mortality of rats (2400 ppm) and mice (1200 and 2400 ppm), with lacrimation, shallow breathing, and prostration prior to death. Congestion of the nasal mucosa, lungs, liver, and kidneys in rats (2400 ppm) and mice (1200 and 2400 ppm) was observed in animals that died and may not be treatment related. Transient increased lacrimation was observed in rabbits at all exposure levels. |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study |
|---------------|------------|-------------------------------|-------------------------|-------------------------|------------------|--------------------------------------|---|-------------------------------|--|
| Ethylbenzene | 100-41-4 | Subchronic toxicity | Rats, mice, and rabbits | Inhalation | Vapor | 6 hours/day, 5 days/week for 4 weeks | 0, 99, 382, and 782 ppm (rats and mice); 0, 383, 782, or 1610 ppm (rabbits) | 5/sex/exposure level | This study included too many groups and doses for a meaningful analysis. |
| Ethylbenzene | 100-41-4 | Subchronic toxicity | Rats | Inhalation | Vapor | 6 hours/day, 5 days/week for 90 days | 0, 100, 250, 500, 750, and 1000 ppm | 10/sex/exposure level | Dose-related increased incidence and severity of regeneration of renal tubules, increased relative kidney (500 ppm and higher) and liver weights (250 ppm and higher). |
| Ethylbenzene | 100-41-4 | Subchronic toxicity | Mice | Inhalation | Vapor | 6 hours/day, 5 days/week for 90 days | 0, 100, 250, 500, 750, and 1000 ppm | 10/sex/exposure level | Increased relative liver (750 ppm and higher) and kidney weights (1000 ppm). |
| Ethylbenzene | 100-41-4 | Subchronic toxicity - Summary | | | | | | | Adequate NTP |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study |
|---------------|------------|-----------------------------------|--------------|-------------------------|------------------|--------------------------------------|---|-------------------------------|--|
| Ethylbenzene | 100-41-4 | Chronic toxicity | Not reported | Inhalation | Not reported | 2 years | Not reported | Not reported | A 13-week study has been completed; the 2-year histopathology evaluation is in progress. |
| Ethylbenzene | 100-41-4 | Chronic toxicity - Summary | | | | | | | No data available 1990 |
| Ethylbenzene | 100-41-4 | Carcinogenicity | Not reported | Inhalation | Not reported | 2 years | Not reported | Not reported | A 13-week study has been completed; the 2-year histopathology evaluation is in progress. |
| Ethylbenzene | 100-41-4 | Carcinogenicity - Summary | | | | | | | No data available 1990 |
| Ethylbenzene | 100-41-4 | Neurotoxicity | Rats | Inhalation | Vapor | 14 hours/day, 7 days/week for 1 week | 0, 1500, 2000, or 3000 ppm for 1.5 hours, 0, 1000, 1500, or 2500 ppm for 2 more hours, and 0, 500, 1000, or 1500 ppm until the end of the study. (The concentration was reduced because of overt toxicity.) | 12 males/group | In all but the group exposed to 1500 followed by 500 ppm, there was a clear impairment of auditory sensitivity which was more noticeable at 16 kHz than 8 kHz. |
| Ethylbenzene | 100-41-4 | Brain chemistry assay | Rabbits | Inhalation | Vapor | 12 hours/day, 7 days | 0 or 750 ppm | 8 males/group | Marked depletion of striatal and tuberoinfundibular dopamine was noted in treated animals. |
| Ethylbenzene | 100-41-4 | Neurotoxicity - Summary | | | | | | | Ototoxicity not available |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study |
|---------------|------------|------------------------|---------|-------------------------|------------------|---|--|-------------------------------|---|
| Ethylbenzene | 100-41-4 | Developmental toxicity | Rats | Inhalation | Vapor | 6 hours/day or continuous exposure on gestation days 7-15 | 6 hours/day: 0 or 600 ppm; or Continuous exposure: 0, 600, 1200, and 2400 mg/m ³ (0, 138.2, 276.3, and 552.6 ppm) | 17 or 19/exposure level | All dams survived; no other maternal effects were reported. In the 6 hour/day exposure group, no embryonic or fetal effects were noted. In the continuous exposure group, significantly ($p<0.05$) increased percent dead or resorbed fetuses and skeletal retardation was seen at 600 mg/m ³ and higher, and at 2400 mg/m ³ decreased fetal weight and increased incidence of extra ribs and skeletal malformations were seen. |
| Ethylbenzene | 100-41-4 | Developmental toxicity | Mice | Inhalation | Vapor | Continuous exposure on gestation days 6-15 | 0 and 500 mg/m ³ (0 and 115.1 ppm) | 20/group | No effects were noted on maternal survival. Increased incidence of anomalies of the urogenital apparatus occurred in treated mice. No other effects were reported. |
| Ethylbenzene | 100-41-4 | Developmental toxicity | Rabbits | Inhalation | Vapor | Continuous exposure on gestation days 7-20 | 0, 500, and 1000 mg/m ³ (0, 115.1, and 230.3 ppm) | 60, 9, and 3 respectively | No effects were noted on maternal survival, weight gain, or relative liver weight. Decreased fetal body weight occurred at 500 mg/m ³ , and all dams aborted at 1,000 mg/m ³ . |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study |
|---------------|------------|------------------------|---------|-------------------------|------------------|--|----------------------|---|---|
| Ethybenzene | 100-41-4 | Developmental toxicity | Rats | Inhalation | Vapor | 7 hours/day on gestation days 1-19 | 0, 100, or 1000 ppm | Not reported; target number of litters/group was 30 | This adequate no to produce |
| Ethybenzene | 100-41-4 | Developmental toxicity | Rabbits | Inhalation | Vapor | 7 hours/day on gestation days 1-24 | 0, 100, and 1000 ppm | 29-30/exposure level | This inadequate no to produce |
| Ethybenzene | 100-41-4 | Developmental toxicity | Rats | Inhalation | Vapor | 7 hours/day, 5 days/week for 3 weeks, followed by mating, then exposure daily through 19 days of gestation | 0, 100, and 1000 ppm | 38 sperm positive | Maternal toxicity (increased relative liver, kidney, and spleen weights; reduced number of sperm-positive rats that were pregnant following pregestational exposures) at high-dose. |
| Ethybenzene | 100-41-4 | Developmental toxicity | Rats | Inhalation | Vapor | | | | Developmental toxicity (increased incidence of supernumerary ribs and decreased crown-rump length) at 1000 ppm. |
| Ethybenzene | 100-41-4 | | | | | | | | Adequate et al. |
| Ethybenzene | 100-41-4 | | | | | | | | No data Clein (Cle) |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study |
|---------------|------------|-----------------------------------|---------|-------------------------|------------------|----------|-----------------|-------------------------------|----------|-------------------------|
| Ethylbenzene | 100-41-4 | Pharmacokinetics - Summary | | | | | | | | Infor ethyl infor (Cle) |

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Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study |
|---------------------|------------|-------------------------------|---------|-------------------------|--|--|-----------------------|-------------------------------|--|----------------------------|
| Ethylene dichloride | 107-06-2 | Epidemiology (Health surveys) | Humans | Occupational exposure | Aircraft industry workers, soft tank producers | Up to approximately 4 years | TWA 10-15 ppm | 83 workers | Liver and gall bladder disease, nervous system dysfunction, and gastrointestinal disorders were observed. | Inadd cont utilz |
| Ethylene dichloride | 107-06-2 | Epidemiology (Case reports) | Humans | Occupational exposure | Oil refinery workers | Not reported | 10 to 200 ppm | 16 males | Burning sensation in the eyes, lacrimation, dizziness, fatigue, drowsiness, nausea, occasional vomiting, constipation, loss of appetite, liver, and G.I. tract effects were noted. | This qual infor effec dich |
| Ethylene dichloride | 107-06-2 | Epidemiology - Summary | | | | | | | | |
| Ethylene dichloride | | | | | | | | | | |
| Ethylene dichloride | 107-06-2 | Acute immuno-toxicity | Rats | Inhalation | Vapor | 3 hours (5 hours for bactericidal activity assays) | 0, 100, and 200 ppm | Males; number not reported | No effects were seen on pulmonary bactericidal activity, nor on alveolar macrophage <i>in vitro</i> phagocytosis of chicken red blood cells, cytostasis, or cytolysis of tumor target cells. Lymphocyte function was not affected. | Inadd limit endp studi |
| Ethylene dichloride | 107-06-2 | Acute immuno-toxicity | Mice | Inhalation | Vapor | 3 hours (5 hours for bactericidal activity assays) | 0, 2.5, 5, and 10 ppm | 18-36 females/group | Increased susceptibility to pulmonary bacterial infection was noted at 5 ppm; no effects were noted on this parameter or on survival at 2.5 ppm. | Inadd limit endp studi |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study |
|---------------------|------------|--|--|-------------------------|------------------|---|---|---|--|--|
| Ethylene dichloride | 107-06-2 | Acute upper respiratory tract irritation study | Rats | Inhalation | Vapor, head only | 10 minute | 8 concentrations ranging from 640 to 12,000 ppm | 4 males/group | No appreciable respiratory rate depression was observed and an RD ₅₀ could not be determined. | This stand toxic |
| Ethylene dichloride | 107-06-2 | Acute toxicity | Mice, rats, and rabbits | Inhalation | Vapor | 1 hour | 200 ppm | 10/group | 4/10 mice died; no mortalities were seen in rats or rabbits. | Inadd one was limit appear exam |
| Ethylene dichloride | 107-06-2 | Acute toxicity | Rats | Inhalation | Vapor | 4 hours | 1000 ppm | 6 males or females | 4/6 died during the 14 day observation period. | Inadd contd report numl level anim uncle |
| Ethylene dichloride | 107-06-2 | Acute toxicity | Rats | Inhalation | Vapor | 0.1 to 7.0 hours to decreasing concentrations | 200 to 12,000 ppm | 4-6/group (sex not reported) | Adverse effects (not described) occurred with exposure to 200 ppm for 5.5 hours up to 12,000 ppm for 0.1 hour. | Inadd Expos for a and 1 test a used. |
| Ethylene dichloride | 107-06-2 | Acute toxicity | Rats | Inhalation | Vapor | 0.5 to 8 hours | 6 concentrations from 300 to 3000 ppm | 10 to 44 males/exposure level | Mortality occurred in all treatment groups except 300 ppm for 7 hours. | Inadd Expos varie contr repor |
| Ethylene dichloride | 107-06-2 | Acute toxicity | Rats, mice, guinea pigs, rabbits, cats, hogs, and raccoons | Inhalation | Vapor | 1.5 to 7 hours | 1500 and 3000 ppm | 13-20 rats, 20-23 mice, 12-14 guinea pigs, 16 rabbits, 3 cats, 2 hogs, and 2 raccoons | Mortality occurred at 3000 ppm in all species except raccoons; 4/20 rats and 20/20 mice died after exposure to 1500 ppm for 7 hours. | Inadd Expos varie expo were of co repor |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study |
|---------------------|------------|---------------------------------|--------------------------------------|-------------------------|------------------|---------------------------------------|---|--|---|--|
| Ethylene dichloride | 107-06-2 | Acute toxicity - Summary | | | | | | | | Adequate animal studies were conducted in rats, guinea pigs, rabbits, and dogs. No effects were noted. |
| Ethylene dichloride | 107-06-2 | Subchronic toxicity | Rabbits | Inhalation | Vapor | 2 hours/day, 5 days/week, 90 days | 3000 ppm | 10 (sex not reported) | Anemia, granuloblastic, and erythroblastic hyperplasia of bone marrow, altered liver and kidney function, and vascular degeneration and focal necrosis of the liver and kidney were observed. | This study was conducted by the manufacturer. |
| Ethylene dichloride | 107-06-2 | Subchronic toxicity | Rats, guinea pigs, rabbits, and cats | Inhalation | Vapor | 6 hours/day, 5 days/week, 6 weeks | 0, 100, and 500 ppm | 10 (rats and guinea pigs) and 4 (rabbits and cats); sexes not reported | Mortality was high in all species following exposure at 500 ppm; necropsy revealed lesions in the liver, kidney, adrenals, heart, and lungs. At 100 ppm, cats had decreased weight gain. No other effects were noted in animals exposed to 100 ppm. | This study was conducted by the manufacturer. |
| Ethylene dichloride | 107-06-2 | Subchronic toxicity | Rats, guinea pigs, rabbits, and cats | Inhalation | Vapor | 6 hours/day, 5 days/week for 26 weeks | 0 and 500 ppm for 13 weeks, followed by 1000 ppm for an additional 13 weeks | 4 cats, 4 rabbits, 10 guinea pigs, and 10 rats equally divided by sex | No adverse effects were seen after 13 weeks at 500 ppm, so animals were exposed for an additional 13 weeks to 1000 ppm. No evidence of toxicity was seen in rats, guinea pigs, or rabbits. In cats, renal injury with histological alterations and increased blood urea developed after the additional high-exposure. | This study was conducted by the manufacturer. |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study |
|---------------------|------------|---|---------|-------------------------|------------------|---|--|--|--|
| Ethylene dichloride | 107-06-2 | Repeated exposure; pulmonary defense evaluation | Rats | Inhalation | Vapor | 5 hours/day, 5 days/week for 12 exposures | 0, 10, 20, 50, or 100 ppm | Males; number not reported. | This stand toxic |
| Ethylene dichloride | 107-06-2 | Repeated exposure; pulmonary defense evaluation | Mice | Inhalation | Vapor | 5 hours/day for 5 days | 0 or 2.5 ppm | 18-36 females/group | No effects were seen on pulmonary bactericidal activity, nor on alveolar macrophage <i>in vitro</i> phagocytosis of chicken red blood cells, cytostasis, or cytolysis of tumor target cells. Lymphocyte function was not affected. |
| Ethylene dichloride | 107-06-2 | Subchronic toxicity - Summary | | | | | | No effects were noted on survival or bactericidal activity at 2.5 ppm. | This stand toxic |
| Ethylene dichloride | 107-06-2 | Chronic toxicity | Rats | Inhalation | Vapor | 7 hours/day, 5 days/week for 78 weeks | 0, 5, 10, and 50 ppm, and 250 ppm reduced to 150 ppm | 90/sev/group | Adeq (TSC 5 spe liver |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study |
|---------------------|------------|-----------------------------------|---|-------------------------|------------------|--|---|---|---|
| Ethylene dichloride | 107-06-2 | Chronic toxicity | Mice | Inhalation | Vapor | 7 hours/day, 5 days/week for 78 weeks | 0, 5, 10, and 50 ppm, and 250 ppm reduced to 150 ppm | 90/sex/group | A high incidence of mortality in the 250 ppm group led to reduced concentration of 150 ppm from a few days (not quantified) to end of the study. No treatment-related increases in incidence of tumors were observed. |
| Ethylene dichloride | 107-06-2 | Chronic toxicity | Rats, guinea pigs, rabbits, and monkeys | Inhalation | Vapor | 7 hours/day, 5 days/week for 170 to 248 days | 100, 200 (rats and guinea pigs only), and 400 ppm (all species) | 15/sex rats; 8/sex guinea pigs; 2 male, 1 female rabbit; and 2 male monkeys | 400 ppm = NOAEL in rabbits; 200 ppm = NOAEL in rats; 100 ppm = NOAEL in other species. Guinea pigs showed decreased body weight, increased relative liver weight and slight hepatic degeneration at 200 ppm. Mortality occurred in all species but in rabbits at 400 ppm. |
| Ethylene dichloride | 107-06-2 | Chronic toxicity - Summary | | | | | | | |

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Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study |
|---------------------|------------|-----------------|---------|-------------------------|------------------|--|--|-------------------------------|---|--|
| Ethylene dichloride | 107-06-2 | Carcinogenicity | Rats | Inhalation | Vapor | 7 hours/day, 5 days/week for 78 weeks | 0, 5, 10, and 50 ppm, and 250 ppm reduced to 150 ppm | 90/sex/group | A high incidence of mortality in the 250 ppm group led to reduced concentration of 150 ppm from week 10 to end of the study. No treatment-related increases in incidence of tumors was observed; however, a non-significant, non-concentration-related increase in benign mammary tumors (fibromas and fibroadenomas) was noted in treated animals. | Adeq exam appro endp |
| Ethylene dichloride | 107-06-2 | Carcinogenicity | Mice | Inhalation | Vapor | 7 hours/day, 5 days/week for 78 weeks | 0, 5, 10, and 50 ppm, and 250 ppm reduced to 150 ppm | 90/sex/group | A high incidence of mortality in the 250 ppm group led to reduced concentration of 150 ppm from a few days (not quantified) to end of the study. No treatment-related increases in incidence of tumors was observed. | Adeq exam appro endp |
| Ethylene dichloride | 107-06-2 | Carcinogenicity | Rats | Inhalation | Vapor | 7 hours/day, 5 days/week for 24 months | 0 and 50 ppm | 50/sex/group | There were no significant changes in body weight or tumor incidence. | This inadd only level this high conc could |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study |
|---------------------|------------|---------------------------|---------|-------------------------|------------------|--------------------------|--|--|--|
| Ethylene dichloride | 107-06-2 | Carcinogenicity | Rats | Oral | Gavage | 5 days/week for 78 weeks | 0, TWA 47, and 95 mg/kg/day | 50/sex/treatment group; 20/sex/control group | Increased mortality occurred at 47 mg/kg/day and higher. Dose-related increased incidence of squamous cell carcinoma of the forestomach, hemangiosarcomas of the circulatory system, and subcutaneous fibromas occurred in treated male rats. Incidence of combined mammary fibromas and adenocarcinomas was also dose-related in females. |
| Ethylene dichloride | 107-06-2 | Carcinogenicity | Mice | Oral | Gavage | 5 days/week, 78 weeks | 0, TWA for males = 97 and 195 mg/kg/day; TWA for females = 149 and 299 mg/kg/day | 50/sex/treatment group; 20/sex/control group | Increased mortality occurred in high-dose females; no other effects on survival were reported. Increased mammary adenocarcinomas and endometrial stromal polyps and sarcomas were seen in females, increased hepatocellular carcinomas were seen in males, and increased alveolar/bronchiolar adenomas were seen in both sexes. |
| Ethylenedichloride | 107-06-2 | Carcinogenicity - Summary | | | | | | | |
| Ethylenedichloride | 107-06-2 | Neurotoxicity - Summary | | | | | | | |

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Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study |
|---------------------|------------|--------------------------------------|---------|-------------------------|------------------|--|------------------------|-------------------------------|---|
| Ethylene dichloride | 107-06-2 | Developmental toxicity | Rats | Inhalation | Vapor | 7 hours/day, gestation days 6 through 15 | 0, 100, and 300 ppm | 16 to 30 bred females/group | Maternal mortality (two-thirds of exposed dams) occurred at 300 ppm. No evidence of maternal or developmental toxicity was seen at 100 ppm. |
| Ethylene dichloride | 107-06-2 | Developmental toxicity | Rabbits | Inhalation | Vapor | 7 hours/day, gestation days 6 through 18 | 0, 100, and 300 ppm | 19-21 bred females/group | Maternal mortality occurred at both treatment levels. No developmental effects were noted at any treatment level. |
| Ethylene dichloride | 107-06-2 | Developmental toxicity - Summary | | | | | | | Adequate location 9/93 |
| Ethylene dichloride | 107-06-2 | Single generation reproduction study | Rats | Inhalation | Vapor | 6 hours/day, 5 days/week during a pre-breeding period of 12 weeks through breeding, gestation, and lactation | 0, 25, 75, and 150 ppm | 30/sex/group | No observable signs of toxicity were seen at any treatment level in dosed parents or offspring. |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study literature |
|---------------------|------------|-------------------------------------|---------|-------------------------|------------------|--|-------------------------|-------------------------------|--|--|
| Ethylene dichloride | 107-06-2 | Multi-generation reproduction study | Mice | Oral | Drinking water | Continuous among P ₀ generation for 5 weeks pre-mating through 2 weeks after weaning; F1 generation for 11 weeks pre-mating through gestation | 0, 30, 90, and 290 mg/L | 10 males and 30 females/group | No observable signs of toxicity were seen at any treatment level in dosed parents or offspring of either generation. | This by law identified effect gene |
| Ethylene dichloride | 107-06-2 | Reproductive toxicity - Summary | | | | | | | | Adequate literature |
| Ethylene dichloride | 107-06-2 | Pharmacokinetics - Summary | | | | | | | | Data inhalation indicates body elimination (HEP) |

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Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/ exposure level | Response | Study location |
|-----------------|------------|---|--|-------------------------|------------------|--|--|---|--|--|
| Ethylene glycol | 107-21-1 | Epidemiology (Human acute exposure) | Humans | Inhalation | Aerosol | Not reported | 3, 67, 140, and 200 mg/m ³ (1.2, 26.4, 55.1, and 78.8 ppm) | Not reported | Subjective reports of irritation at 140 mg/m ³ and intolerable at 200 mg/m ³ ; no effects were reported at 3 or 67 mg/m ³ . | Ther- apeutic guidelines toxic humans |
| Ethylene glycol | 107-21-1 | Epidemiology (Human repeated exposure) | Humans | Inhalation | Aerosol | 20-22 hours/day for 7 or 30 days | 0 or 30 mg/m ³ (0 or 11.8 ppm) | 4 men/preliminary exposure group 20 men/main study group | No effects on hematology, clinical chemistry, urinalysis, EKG, EEG, psychological testing of reaction time, visual- motor coordination, perception, or mental ability. | Studied experts exposure humans requiring TSC |
| Ethylene glycol | 107-21-1 | Epidemiology - Summary | | | | | | | | |
| Ethylene glycol | 107-21-1 | Acute toxicity - Summary | | | | | | | | |
| Ethylene glycol | 107-21-1 | Subchronic toxicity | Rats, guinea pigs, rabbits, monkeys, and dogs | Inhalation | Vapor | Continuously for 90 days | 0 or 12 mg/m ³ (0 or 4.7 ppm) | 15 rats/sex/ exposure group; 15 guinea pigs/sex/ exposure group; 3 male rabbits/ exposure group; 3 male monkeys/ exposure group; and 2 male dogs/ exposure group | Mortality was observed in 1/15 rats, 3/15 guinea pigs, and 1/3 rabbits; increased pulmonary inflammation was observed in all species; ocular irritation and edema was observed in rabbits, and 2 rats became blind. | A line further located |
| Ethylene glycol | 107-21-1 | No data available | | | | | | | | |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study |
|-----------------|------------|-------------------------------|---|-------------------------|------------------|--------------------------------------|---|---|--|
| Ethylene glycol | 107-21-1 | Subchronic toxicity | Rats, guinea pigs, rabbits, monkeys, and dogs | Inhalation | Vapor | 8 hours/day, 5 days/week for 6 weeks | 0, 10, or 57 mg/m ³ (0, 3.9, or 22.4 ppm) | 15 rats/sex/exposure group; 15 guinea pigs/sex/exposure group; 3 male rabbits/exposure group; 3 male monkeys/exposure group; and 2 male dogs/exposure group | No mortality was observed; nonspecific inflammatory changes in the hearts and lungs were observed in all species at 57 mg/m ³ , but not at 10 mg/m ³ . |
| Ethylene glycol | 107-21-1 | Subchronic toxicity - Summary | | | | | | | Inadequate toxicological data |
| Ethylene glycol | 107-21-1 | Chronic toxicity - Summary | | | | | | | No detailed location information |
| Ethylene glycol | 107-21-1 | Carcinogenicity | Mice | Oral | Diet | 2 years | Males: 0, 6250, 12,500, or 25,000 ppm (approximately 1500, 3000, or 6000 mg/kg/day) | 60/sex/group | No chemical-related neoplasms were seen in mice of either sex at any treatment level. The range of exposures encompassed levels that produced systemic toxicity. |
| Ethylene glycol | 107-21-1 | | | | | | Females: 0, 12,500, 25,000, or 50,000 ppm (approximately 3000, 6000, or 12,000 mg/kg/day) | | This dietary approach endpoint examination is an active protocol |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study |
|-----------------|------------|---------------------------|---------|-------------------------|------------------|-----------|-------------------------------|-------------------------------|---|
| Ethylene glycol | 107-21-1 | Carcinogenicity | Rats | Oral | Diet | 24 months | 0.04, 0.2, or 1.0 g/kg bw/day | 26/sex/group | This well group half recon TSC guid |
| Ethylene glycol | 107-21-1 | Carcinogenicity | Mice | Oral | Diet | 24 months | 0.04, 0.2, or 1.0 g/kg bw/day | 16/sex/group | This well study only sex g rathe recon TSC guid |
| Ethylene glycol | 107-21-1 | Carcinogenicity - Summary | | | | | | | No d expo Ade prov comp 7/93 |
| Ethylene glycol | 107-21-1 | Neurotoxicity - Summary | | | | | | | No m SRC |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study |
|-----------------|------------|------------------------|---------|-------------------------|------------------|------------------------------------|--|-------------------------------|--|
| Ethylene glycol | 107-21-1 | Developmental toxicity | Rats | Inhalation | Aerosol | 6 hours/day on gestation days 6-15 | 0, 60, 400, and 1000 ppm (0, 150, 1000, and 2500 mg/m ³) | 25/exposure group | Increased maternal absolute and relative liver weights (this may not be a toxic effect) at 1000 ppm; increased delayed ossification in the fetal hindlimbs at 400 and 1000 ppm. |
| Ethylene glycol | 107-21-1 | Developmental toxicity | Mice | Inhalation | Aerosol | 6 hours/day on gestation days 6-15 | 0, 60, 400, and 1000 ppm (0, 150, 1000 and 2500 mg/m ³) | 25/exposure group | Decreased maternal body weight at 400 and 1000 ppm; developmental toxicity observed at 400 and 1000 ppm included increased number of late resorptions and increased incidence of external, visceral, and skeletal malformations. |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study |
|-----------------|------------|------------------------|---------|---|---------------------|------------------------------------|---|--|--|
| Ethylene glycol | 107-21-1 | Developmental toxicity | Mice | Inhalation (nose-only or whole-body exposure) | Aerosol | 6 hours/day on gestation days 6-15 | Nose-only: 0, 500, 1000, and 2500 mg/m ³ (0, 196.9, 393.8, and 984.6 ppm) Whole-body: as positive control: 0 and 2100 mg/m ³ (0 and 827.1 ppm) | 30/exposure group | Maternal kidney weights were increased at 1000 and 2500 mg/m ³ (no accompanying histologic changes were seen). Developmental toxicity (decreased fetal body weights and increased incidence of skeletal variations) was observed at 2500 mg/m ³ . |
| Ethylene glycol | 107-21-1 | Developmental toxicity | Mice | Inhalation (nose-only or whole-body exposure) | Aerosol | 6 hours/day on gestation day 6 | Nose-only: 2500 mg/m ³ (984.6 ppm) Whole-body: 2100 mg/m ³ (827.1 ppm) | 5/exposure group | These satellite females were sacrificed immediately after one exposure and washed in hot water to determine the amount of ethylene glycol on the fur. The quantity available for potential ingestion following whole-body exposure to 2100 mg/m ³ was 1390 mg/kg, and after nose-only exposure to 2500 mg/m ³ was 330 mg/kg. |
| Ethylene glycol | 107-21-1 | Developmental toxicity | Rats | Dietary | Gestation days 6-15 | 0, 40, 200, 1000 mg/kg/day | 20 females/group | No maternal toxicity was seen at any treatment level. Slightly increased preimplantation loss and significantly increased incidence of poorly ossified and unossified vertebral centra were noted at 1000 mg/kg/day. | |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study |
|-----------------|------------|-------------------------------|---------|-------------------------|------------------|-----------------------------------|---|--------------------------------|---|
| Ethylene glycol | 107-21-1 | Developmental toxicity screen | Mice | Oral | Gavage | 1 dose/day on gestation days 7-14 | 0 or 11090 mg/kg/day (maximum tolerated dose) | 50/exposure group | Decreased maternal body weight gain, fetal weight, and litter viability were seen in treated mice. |
| Ethylene glycol | 107-21-1 | Developmental toxicity | Mice | Oral | Gavage | 1 dose/day on gestation days 6-15 | 0, 750, 1500, and 3000 mg/kg/day | 23-24/exposure group | Maternal toxicity was noted at mid- and high-dose (decreased body weight gain and gravid uterine weight). Developmental toxicity (decreased average fetal body weight/litter) was noted in all treatment groups, and number of live fetuses/litter was decreased at high-dose. Malformation incidence (gross, visceral, and skeletal) was increased at all treatment levels. |
| Ethylene glycol | 107-21-1 | Developmental toxicity | Rats | Oral | Gavage | 1 dose/day on gestation days 6-20 | 0, 250, 1250, and 2250 mg/kg/day | 16-20/exposure (4-5/replicate) | Maternal toxicity was observed at 1250 mg/kg/day and above (treatment-related renal pathology). At 2250 mg/kg/day, decreased body weight, body weight gain, and decreased absolute and relative kidney and postpartum uterine weights were observed. Developmental toxicity occurred at 2250 mg/kg/day (decreased live litter size, neonatal pup body weight, and increased mortality). |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study |
|-----------------|------------|---------------------------------------|---------|-------------------------|------------------|-----------------------------------|---|-------------------------------|--|
| Ethylene glycol | 107-21-1 | Developmental toxicity, pilot study | Rabbits | Oral | Gavage | 1 dose/day on gestation days 6-19 | 0, 100, 500, 1000, and 2000 mg/kg/day | 23-24/group | Maternal toxicity was observed at 2000 mg/kg/day (42% mortality, early deliveries and spontaneous abortion, renal pathology). No evidence of embryo/foetal or teratogenicity was noted at any treatment level. |
| Ethylene glycol | 107-21-1 | Developmental toxicity - Summary | | | | | | | Adequate development |
| Ethylene glycol | 107-21-1 | Multigeneration reproductive toxicity | Rats | Oral | Diet | Continuous for 3 generations | 0, 40, 200, and 1000 mg/kg/day | 10-20/sex/generation | No general toxicity effects were observed, nor were there effects on fertility index, gestation in F ₀ , F ₁ , or F ₂ rats, histopathology of testes, epididymis, accessory sex glands, uterus, or ovaries in any generation through F ₃ rats. |
| Ethylene glycol | 107-21-1 | Continuous breeding study | Mice | Oral | Drinking water | Continuously for 2 generations | 0, 0.25%, 0.5%. and 1.0%. Authors estimated doses of 0, 0.41, 0.84 and 1.64 g/kg. | 20/sex/generation | No effects were observed in the 0.25% groups. At the 1% level, there was a decrease in the number of litters/fetal pairs, live pups/litter, and live pup weight (this also occurred in the 0.5% group). In the 1% level, there was an increase in facial and skeletal abnormalities. |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study |
|-----------------|------------|---------------------------------|---------|-------------------------|------------------|--------------------------------|---|-------------------------------|---|
| Ethylene glycol | 107-21-1 | Continuous breeding study | Mice | Oral | Drinking water | Continuously for 2 generations | 0, 0.5%, 1.0% and 1.5%. Authors estimated doses of 0, 0.9, 1.8, 2.8 g/kg. | 20/sex/generation | At the 1.5% level, there was decreased fertility index, female pups/litter, pup weight, and increased pup death during weaning. At 1.0% and higher, there was facial abnormalities, and ablepharon. In the high dose males, sperm mobility was decreased, the number of abnormal sperm increased, and there was degeneration of the testes. |
| Ethylene glycol | 107-21-1 | Reproductive toxicity - Summary | | | | | | | Sufficient reproductive mate female tested |
| Ethylene glycol | 107-21-1 | Pharmacokinetics - Summary | | | | | | | Information available 1993 |

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Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study |
|------------------------|------------|-----------------------------|---------|-------------------------|------------------|---|---|---|--|
| Methyl isobutyl ketone | 108-10-1 | Epidemiology (Case studies) | Humans | Inhalation | Vapor | 20-30 minutes of high-exposure; low-exposure for rest of work day | 80 ppm (low exposure) and 500 ppm (high-exposure) | 19 workers | Over 50% of the workers complained of nausea, headache, burning in the eyes, and weakness. Somnolence, insomnia, and intestinal pain were also reported. 4 of the workers had enlarged livers. |
| Methyl isobutyl ketone | 108-10-1 | Epidemiology (Case studies) | Humans | Inhalation | Vapor | 15-30 minutes of high-exposure; low-exposure for rest of work day | 50 ppm (low exposure) and 100-105 ppm (high-exposure) | 14 cases | A few workers complained of gastrointestinal and CNS symptoms. 2 of the workers had enlarged livers. |
| Methyl isobutyl ketone | 108-10-1 | Epidemiology (Case studies) | Humans | Inhalation | Vapor | 2 hours with exercise | 10, 100, and 200 mg/m ³ (2.4, 24.4, and 48.8 ppm) MIBK; or 100 mg/m ³ (24.4 ppm) MIBK plus 150 mg/m ³ (39.6 ppm) toluene | 8 males exposed to various concentrations in sequence | Irritation (p = 0.066) and undefined CNS symptoms (p = 0.101) were reported. Effects from MIBK alone were noted at all treatment levels and showed an exposure-related trend. Effects were greater from exposure to a mixture of MIBK and toluene than to the single substance. No effects were noted on simple reaction time, ability to do mental arithmetic, or mood. |
| Methyl isobutyl ketone | 108-10-1 | Epidemiology - Summary | | | | | | | There are no guidelines in humans. |

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Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Site |
|------------------------|------------|--------------------------|-------------------------------|-------------------------|------------------|------------------------|------------------------|---|---|
| Methyl isobutyl ketone | 108-10-1 | Acute toxicity | Mice | Inhalation | Vapor | 30 minutes | 19,500 and >20,000 ppm | 10/exposure group | Anesthesia was produced in 7/10 animals at 19,500 ppm; however, all recovered normally following removal. Deep anesthesia was observed in mice at >20,000 ppm, and these mice did not recover. Mice dying had some congestion of the lungs. |
| Methyl isobutyl ketone | 108-10-1 | Acute toxicity - Summary | Rats, dogs, mice, and monkeys | Inhalation | Vapor | Continuous for 2 weeks | 0, 100, and 200 ppm | 50 rats/exposure group; 40 mice/exposure group; 8 dogs/exposure group; 4 monkeys/exposure group | Increased relative kidney weights at 100 and 200 ppm, and increased relative liver weights at 200 ppm. |
| Methyl isobutyl ketone | 108-10-1 | Subchronic toxicity | Rats, dogs, mice, and monkeys | Inhalation | Vapor | Continuous for 90 days | 0 or 410 ppm | 100 male rats/exposure group; 8 male dogs/exposure group; 2 male monkeys/exposure group | No effects were observed in dogs and monkeys; rats had increased relative liver and kidney weights, and hyaline droplet degeneration of the proximal tubules with occasional tubular necrosis. |
| Data inadmissible | | | | | | | | | |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study |
|--------------------------------------|------------|----------------------------|---------|-------------------------|------------------|---------------------------------------|--------------------------|-------------------------------|---|
| Methyl isobutyl ketone | 108-10-1 | Subchronic toxicity | Rats | Inhalation | Vapor | 6 hours/day, 5 days/week for 14 weeks | 0, 50, 250, and 1000 ppm | 14/sex/exposure level | This subcl study. |
| Methyl isobutyl ketone | 108-10-1 | Subchronic toxicity | Mice | Inhalation | Vapor | 6 hours/day, 5 days/week for 14 weeks | 0, 50, 250, and 1000 ppm | 14/sex/exposure level | This subcl study. |
| Methyl isobutyl ketone | 108-10-1 | Subchronic toxicity | | | | | | | Adequate speci |
| Subchronic toxicity - Summary | | | | | | | | | |
| Methyl isobutyl ketone | 108-10-1 | Chronic toxicity - Summary | | | | | | | No d were |
| Methyl isobutyl ketone | 108-10-1 | Carcinogenicity - Summary | | | | | | | No d (HE/nomin (CHI) |
| Methyl isobutyl ketone | 108-10-1 | Neurotoxicity | Baboons | Inhalation | Vapor | Continuously for 7 days | 0 or 50 ppm | 4 juvenile males | Minimal effects in accuracy were observed in a delayed match-to-sample discrimination task, but response time was slowed. |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study |
|------------------------|------------|--------------------------------|---------|-------------------------|------------------|---|-----------------------------------|---|--|-------------|
| Methyl isobutyl ketone | 108-10-1 | Neurotoxicity | Hens | Inhalation | Vapor | Continuously for 90 days, followed by a 30-day observation period | 0 or 1000 ppm 5/exposure level | Leg weakness was observed during exposure, followed by subsequent recovery. | This inad- deve- becau- expo- used size | |
| Methyl isobutyl ketone | 108-10-1 | Neurotoxicity - Summary | | | | | | | | |
| Methyl isobutyl ketone | 108-10-1 | Developmental toxicity | Mice | Inhalation | Vapor | 6 hours/day on gestation days 6-15 | 0, 300, 1000, and 3000 ppm | 25/exposure level | Maternal toxicity (decreased body weight gain, loss of coordination, negative tail and toe pinch, partial paralysis, muscular weakness in hindlimbs, piloerection, lacrimation, and red perioral encrustation) was observed at 3000 ppm; decreased fetal body weights and increased incidence of unossified skeletal elements at 3000 ppm. | |
| Methyl isobutyl ketone | 108-10-1 | Developmental toxicity | Rats | Inhalation | Vapor | 6 hours/day on gestation days 6-15 | 0, 300, 1000, and 3000 ppm | 25/exposure level | Maternal toxicity (decreased body weight gain, loss of coordination, negative tail and toe pinch, partial paralysis, muscular weakness in hindlimbs, piloerection, lacrimation, and red perioral encrustation) was observed at 3000 ppm; decreased fetal body weights and increased incidence of unossified skeletal elements at 3000 ppm. | This study, |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study |
|------------------------|------------|---|---------|-------------------------|------------------|----------|-----------------|-------------------------------|----------|---------------|
| Methyl isobutyl ketone | 108-10-1 | Developmental toxicity - Summary | | | | | | | | Adequate (HE) |
| Methyl isobutyl ketone | 108-10-1 | Reproductive toxicity - Summary | | | | | | No data located | | |
| Methyl isobutyl ketone | 108-10-1 | Pharmacokinetics - Summary | | | | | | Limited ketone (HE) | | |

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Table of Toxicity Data for HAPs (continued)

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Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study |
|------------------|------------|---------------------------------|---------|-------------------------|------------------|--------------------------------|--|-------------------------------|---|--------------------------------------|
| Maleic anhydride | 108-31-6 | Epidemiology (Case study) | Humans | Inhalation | Aerosol | 1 month | Not reported | 1 male | A 64 year old man developed a cough, rhinitis, breathlessness, and wheezing. He had a positive patch test for MA, and he developed an asthmatic reaction starting 2 minutes after exposure to 0.09 ng/m ³ of respirable MA dust. | This accept prove |
| Maleic anhydride | 108-31-6 | Epidemiology (Acute toxicity) | Humans | Inhalation | Aerosol | 5 minutes, 1 hour, and 4 hours | 2.5, 4.5, 10, 20, and 30 ppm for 5 minute exposure; 6 ppm for 1 hour exposure; 5 ppm for 4 hour exposure | 5-10 subjects/exposure group | Greater than slight eye irritation was observed at 20 ppm and higher; greater than slight nose irritation and pulmonary discomfort was observed at 30 ppm and higher; no effect on CNS or respiratory function. | This demand irrita to hu anhy acuted |
| Maleic anhydride | 108-31-6 | Epidemiology - Summary | | | | | | | | Severe anhy and c |
| Maleic anhydride | 108-31-6 | Acute toxicity - Summary | | | | | | | | Additi requir of en |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study |
|------------------|------------|---------------------|------------------------------------|-------------------------|------------------|---|--|---|---|
| Maleic anhydride | 108-31-6 | Subchronic toxicity | Rats, hamsters, and rhesus monkeys | Inhalation | Aerosol | 6 hours/day, 5 days/week for 6 months | 1, 3, or 10 mg/m ³ (0.2, 0.7, or 2.5 ppm) | 15/sex/group (rats and hamsters) 3/sex/group (monkeys) | There were no treatment related deaths. There were intermittent reduced body weights in the mid dose rats and reduced body weights from day 40 to the end of the study in male rats. There was no effect on body weight in the other species. Nasal and ocular irritations were observed in all groups; this was considered reversible. There were no treatment-related hematological or clinical chemistry, urinalysis, or pulmonary function effects. |
| Maleic anhydride | 108-31-6 | Subchronic toxicity | Rats | Inhalation | Aerosol | 6 hours/day, 5 days/week for 21-22 exposures (~30 days) | 0, 0.012, 0.032, and 0.0860 mg/L (12, 32, and 86 mg/m ³) (0, 2.9, 7.9, and 21.4 ppm) | 10/sex/exposure group | Reduced body weights at 0.032, and 0.0860 mg/L; numerous upper respiratory lesions were observed at 0.012, 0.032, and 0.0860 mg/L, and numerous lung lesions were observed at 0.032 and 0.0860 mg/L. |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study |
|------------------|------------|--------------------------------------|----------|-------------------------|------------------|---------------------------------------|--|-------------------------------|---|
| Maleic anhydride | 108-31-6 | Subchronic toxicity | Rats | Inhalation | Aerosol | 6 hours/day, 5 days/week for 6 months | 0, 0.0011, 0.0033, and 0.010 mg/L (0, 0.3, 0.8, and 2.5 ppm) | 15/sex/exposure group | Reduced body weights at 0.0033 and 0.010 mg/L. Dose-related red-tinged nasal discharge and sneezing. Brain cholinesterase was increased at 0.0033 and 0.010 mg/L, however the authors did not consider this effect to be treatment related. No histological evidence of damage to the respiratory tract was observed. |
| Maleic anhydride | 108-31-6 | Subchronic toxicity | Hamsters | Inhalation | Aerosol | 6 hours/day, 5 days/week for 6 months | 0, 0.0011, 0.0033, and 0.010 mg/L (0, 0.3, 0.8, and 2.5 ppm) | 15/sex/exposure group | Nasal discharge, ocular irritation, dyspnea, and gasping were observed at 0.010 mg/L. Brain cholinesterase was increased at 0.010 mg/L. No histological evidence of damage to the respiratory tract was observed. |
| Maleic anhydride | 108-31-6 | Subchronic toxicity | Monkeys | Inhalation | Aerosol | 6 hours/day, 5 days/week for 6 months | 0, 0.0011, 0.0033, and 0.010 mg/L (0, 0.3, 0.8, and 2.5 ppm) | 3/sex/exposure group | Nasal and ocular irritation, and slight dyspnea with coughing and sneezing were observed at 0.010 mg/L. No histological evidence of damage to the respiratory tract was observed. |
| Maleic anhydride | 108-31-6 | Subchronic toxicity - Summary | | | | | | | Subchronic study |
| Maleic anhydride | 108-31-6 | Chronic toxicity - Summary | | | | | | | No data located |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study |
|------------------|------------|----------------------------------|---------|-------------------------|------------------|------------------------------|------------------------------|-------------------------------|---|------------------|
| Maleic anhydride | 108-31-6 | Carcinogenicity | Rats | Oral | Diet | 2 years | 0, 10, 32, and 100 mg/kg/day | 126/sex/group | No treatment-related increased incidence of neoplastic lesions was noted. | Inadd locat 1992 |
| Maleic anhydride | 108-31-6 | Carcinogenicity - Summary | | | | | | | | |
| Maleic anhydride | 108-31-6 | Neurotoxicity - Summary | | | | | | | | |
| Maleic anhydride | 108-31-6 | Developmental toxicity | Rats | Oral | Gavage | Daily on gestation days 6-15 | 0, 30, 90, and 140 mg/kg/day | 25/exposure group | Reduced body weight gain was observed in dams at all exposure levels. No developmental toxicity was observed. | 1986 |
| Maleic anhydride | 108-31-6 | Developmental toxicity - Summary | | | | | | | | An a avail male |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study route |
|------------------|------------|---------------------------------|---------|-------------------------|------------------|--|------------------------------|---|--|
| Maleic anhydride | 108-31-6 | Reproductive toxicity | Rats | Oral | Gavage | Daily during an 80-day pre mating period, mating, gestation, and lactation for 2-generations | 0, 20, 55, and 150 mg/kg/day | 10-20/sex/ exposure group/ generation | This 2-generation report reproduced toxic level parent |
| Maleic anhydride | 108-31-6 | Reproductive toxicity - Summary | | | | | | 65 and 100% mortality in males and females, respectively, reduced body weight gain, and renal cortical necrosis was observed at the high-dose level. Pup growth was decreased at 150 mg/kg. The high mortality was the result of gavage errors. | |
| Maleic anhydride | 108-31-6 | Pharmacokinetics - Summary | | | | | | | An oral route inhal 1992 |

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Table of Toxicity Data for HAPs (continued)

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Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study |
|-------------------------------|------------|---------------------|--------------------------------|-------------------------|------------------|---------------------------------------|----------------------------|--------------------------------------|---|--|
| Epidemiology - Summary | | | | | | | | | | |
| Chlorobenzene | 108-90-7 | | Mice and guinea pigs | Inhalation | Vapor | 2 hours | Not reported | Not reported | LC ₅₀ in guinea pig was 50 mg/m ³ LC ₅₀ in mice was 20,000 mg/m ³ | One chlor (Roz Inco data. |
| Chlorobenzene | 108-90-7 | Acute toxicity | Rats and guinea pigs | Inhalation | Vapor | 30 minutes | 0,2990, 5850, and 7970 ppm | 5/sex/exposure level | Slight eye and nasal irritation at 2990 ppm; narcotic effects at 5850 and 7970 ppm; no mortality. | This demo follow expo |
| Chlorobenzene | 108-90-7 | Acute toxicity | Rats, rabbits, and guinea pigs | Inhalation | Vapor | 7 hours/day, 5 days/week for 44 days | 475 or 1000 ppm | Not reported | At low exposure, liver, kidney, and lung lesions were observed in guinea pigs. These signs were observed in all species at the high exposure level. | Adechlor (TSC) |
| Chlorobenzene | 108-90-7 | Subchronic toxicity | | | | | | | | Testis cond inadd at on expo is no many were |
| Chlorobenzene | 108-90-7 | Subchronic toxicity | Mice | Inhalation | Vapor | 7 hours/day, 7 days/week for 3 months | 0.1 mg/L (22 ppm) | 5 males and 5 females/exposure group | Agitation and increased movement were noted in treated animals, but no other changes in behavior. Leukopenia and lymphocytosis were noted. | Inadd study limit and expo used |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study limit and exposure used |
|---------------|------------|-------------------------------|---------|-------------------------|------------------|---------------------------------------|--|--------------------------------------|--|--|
| Chlorobenzene | 108-90-7 | Subchronic toxicity | Mice | Inhalation | Vapor | 7 hours/day, 7 days/week for 3 weeks | 0 and 2.5 mg/L (0 and 543 ppm) | 5 males and 5 females/exposure group | Half of the animals died after dosing. Loss of appetite, general emaciation, neutropenia, and marked somnolence were observed. There was a statistically significant drop in WBC and an indication that there was damage to the bone marrow. | Inadequate study limit and exposure used |
| Chlorobenzene | 108-90-7 | Subchronic toxicity | Rats | Inhalation | Vapor | 7 hours/day, 5 days/week for 24 weeks | 0, 73, or 248 ppm | 32 males/group | Microscopic lesions in adrenal cortex, kidney, liver congestion, and decreased SGOT at 73 and 248 ppm. | The study by us exposed treated only. |
| Chlorobenzene | 108-90-7 | Subchronic toxicity | Rabbits | Inhalation | Vapor | 7 hours/day, 5 days/week for 24 weeks | 0, 73, or 248 ppm | 32 males/group | Decreased LDH and liver congestion at 73 and 248 ppm. | The study by us exposed treated only. |
| Chlorobenzene | 108-90-7 | Subchronic toxicity - Summary | | | | | | | | Adequate study available 1990 |
| Chlorobenzene | 108-90-7 | Chronic toxicity - Summary | | | | | | | | No data available (ATSDR) |
| Chlorobenzene | 108-90-7 | Carcinogenicity | Rats | Oral | Gavage | 5 days/week for 103 weeks | 0, 60, or 120 mg/kg | 50/sex | Small increase in neoplastic nodules in male rats of the high dose group. | Adequate study |
| Chlorobenzene | 108-90-7 | Carcinogenicity | Mice | Oral | Gavage | 5 days/week for 103 weeks | 0, 60, or 120 mg/kg (females), or 0, 30, or 60 mg/kg (males) | 50/sex | No increased incidence of tumors. | Adequate study |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study | |
|----------------------------------|------------|------------------------|---------|-------------------------|------------------|---------------------------------------|--|-------------------------------|---|--------------------------------------|-------------------------------------|
| Carcinogenicity - Summary | | | | | | | | | | | |
| Chlorobenzene | 108-90-7 | Neurotoxicity | Rats | Inhalation | Vapor | 14 hours/day, 7 days/week for 1 weeks | 0, 1500, 2000, or 3000 ppm for 2 hours; 0, 500, 1500, or 2000 ppm for the remaining 5 hours and after the 5th day; 0, 500, 1000, or 1500 ppm on the 6th day, and 0, 500, 1000, or 250 ppm on the 7th day, respectively. (The concentration was reduced because of overt toxicity.) | 12/males/group | In all but the group exposed to 1500 followed by 500 ppm, there was a clear impairment of auditory sensitivity which was more noticeable at 16 kHz than 8 kHz. | No d (TSC carcin) | This inad- conc- reduce study over- |
| Chlorobenzene | 108-90-7 | Neurotoxicity | Rats | Inhalation | Vapor | 6 hours/day on gestation days 6-15 | 0, 75, 210, or 590 ppm | 32-33/group | Decreased maternal body weight gain (only for days 6-8), and increased absolute and relative liver weights at 590 ppm; increased incidence of skeletal abnormalities (delayed ossification, bilobed centra, and cervical spurs) at 590 ppm. | Ototo- neuro- | |
| Neurotoxicity - Summary | | | | | | | | | | | |
| Chlorobenzene | 108-90-7 | Developmental toxicity | Rats | Inhalation | Vapor | 6 hours/day on gestation days 6-15 | 0, 75, 210, or 590 ppm | 32-33/group | Decreased maternal body weight gain (only for days 6-8), and increased absolute and relative liver weights at 590 ppm; increased incidence of skeletal abnormalities (delayed ossification, bilobed centra, and cervical spurs) at 590 ppm. | This study deve toxic expo prod mate | |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study/Deve/Toxic/Level/Mate |
|---------------|------------|----------------------------------|---------|-------------------------|------------------|--|---------------------------|-------------------------------|---|----------------------------------|
| Chlorobenzene | 108-90-7 | Developmental toxicity | Rabbits | Inhalation | Vapor | 6 hours/day on gestation days 6-18 | 0, 75, 210, or 590 ppm | 30/exposure group | Maternal toxicity in the form of increased absolute and relative liver weight at 210 ppm; increased resorption rate and number of malformed fetuses at 590 ppm. | This study deve toxic level mate |
| Chlorobenzene | 108-90-7 | Developmental toxicity | Rabbits | Inhalation | Vapor | 6 hours/day on gestation days 6-18 | 0, 10, 30, 75, or 590 ppm | 29-32/exposure group | Maternal toxicity in the form of increased liver weight at 590 ppm, and there was a significant increase in resorption in this group. | This study deve toxic level mate |
| Chlorobenzene | 108-90-7 | Developmental toxicity - Summary | | | | | | | | Adequate (ATSDR deve) |
| Chlorobenzene | 108-90-7 | Reproductive toxicity | Rats | Inhalation | Vapor | 6 hours/day, 7 days/week for 2 generations | 0, 50, 150, or 450 ppm | 30/sex/group/generation | Parental toxicity (hepatocellular hypertrophy, renal degeneration, and testicular degeneration of the germinal epithelium) at 150 and 450 ppm; other than affect on the testis, no reproductive parameters were affected. | This 2-gen repro toxic |
| Chlorobenzene | 108-90-7 | Reproductive toxicity - Summary | | | | | | | | An animal rats |
| Chlorobenzene | 108-90-7 | Pharmacokinetics - Summary | | | | | | | | Information was expo |

Table of Toxicity Data for HAPs (continued)

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Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Status |
|---------------|------------|---------------------------------|---------|-------------------------|------------------|---|-----------------------|--|--|----------------------------------|
| Phenol | 108-95-2 | Epidemiology (Case report) | Humans | Inhalation and dermal | Not reported | Intermittent exposure for an unspecified length of time | Not reported | 1 male | Muscle pain and weakness that may represent a neurological effect. | Inadequate information available |
| Phenol | 108-95-2 | Epidemiology - Summary | | | | | | | | |
| Phenol | 108-95-2 | Acute toxicity/ Immunotoxicity | Mice | Inhalation | Vapor | 5 replicate challenges of single 3-hour exposures | approximately 5.6 ppm | approximately 30/group for the streptococcus infectivity study and 18/group for the pulmonary bactericidal activity assay. | Phenol did not produce significant changes in mortality from streptococcal challenge. There were no significant effects on bactericidal activity. | Inadequate information available |
| Phenol | 108-95-2 | Acute toxicity | Rats | Inhalation | Not reported | 24 hours/day for 15 days | 0 and 26 ppm | Males and females; number/group not reported | Increased activity, motor disorders; involuntary muscle twitching, especially in the neck region, during treatment; and increased plasma potassium and magnesium levels. | Inadequate information available |
| Phenol | 108-95-2 | Acute toxicity | Mice | Inhalation | Not reported | 4 exposure level (concentration not reported) for 5 minutes | Not reported | Males; number/group not reported | 0.1 RD ₅₀ (50% decrease in respiratory rate) was 17 ppm and irritation of the upper respiratory tract was observed. | Inadequate information available |
| Phenol | 108-95-2 | Acute toxicity - Summary | | | | | | | | |
| | | | | | | | | | | |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study comments |
|---------------|------------|--------------------------------------|-------------------------|-------------------------|------------------|--------------------------------------|-----------------|--|--|---------------------------|
| Phenol | 108-95-2 | Subchronic toxicity | Rats | Inhalation | Vapor | 7 hours/day, 5 days/week for 74 days | 26 ppm | 15/group; sex not reported | No effects noted on survival, clinical signs, nor gross or histopathology. | Inaddl cont sex conc used |
| Phenol | 108-95-2 | Subchronic toxicity | Rabbits | Inhalation | Vapor | 7 hours/day, 5 days/week for 88 days | 26 ppm | 6/group, sex not reported | Pulmonary congestion and hyperplasia, myocardial degeneration, centrolobular degeneration of the liver, and edema of the liver. | Inaddl cont sex conc used |
| Phenol | 108-95-2 | Subchronic toxicity | Guinea pigs | Inhalation | Vapor | 7 hours/day, 5 days/week for 74 days | 26 ppm | 12/group; sex not reported | 5 animals died after 20 exposures; liver and heart necrosis, pneumonia, renal cortical injury, and hind limb paralysis were noted. | Inaddl cont sex conc used |
| Phenol | 108-95-2 | Subchronic toxicity | Rats, mice, and monkeys | Inhalation | Vapor | Continuous exposure for 90 days | 0 and 5 ppm | 50 rats, 100 mice, and 10 monkeys; all males | No effects on survival, hematology, or pathology were noted in any species. | Inaddl one conc used |
| Phenol | 108-95-2 | Subchronic toxicity | Not reported | Inhalation | Not reported | Not reported | Not reported | Results are not yet available. | Results are not yet available. | Adeq phen deter |
| Phenol | 108-95-2 | Subchronic toxicity - Summary | | | | | | | | |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study Chro 1989 |
|-----------------------------------|------------|---------------------------|---------|-------------------------|------------------|--------------------------|----------------------|--|--|
| Chronic toxicity - Summary | | | | | | | | | |
| Phenol | 108-95-2 | Carcinogenicity | Rats | Oral | Drinking water | 105 weeks | 0, 2500, or 5000 ppm | Equivocal evidence of carcinogenicity. At the low dose, but not the high dose, there was an increased incidence of leukemia, lymphoma, and pheochromocytomas in the adrenals of male rats. | Inadd the c had i high tumo |
| Phenol | 108-95-2 | Carcinogenicity | Mice | Oral | Drinking water | 105 weeks | 0, 2500, or 5000 ppm | Increased uterine endometrial stromal polyps relative to matched controls were observed in high-dose females (5/48), but this did not exceed those observed in historical controls (frequency not reported). | Inadd was a tox obtain |
| Phenol | 108-95-2 | Carcinogenicity - Summary | | | | | | | Carc data nomi 7/93 |
| Phenol | 108-95-2 | Neurotoxicity | Rats | Inhalation | Not reported | 24 hours/day for 15 days | 0 and 26 ppm | Males and females tested, number not reported | Inadd Insul endp exam of an unkno insuff expo were |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study |
|---------------|------------|------------------------------------|--------------|-------------------------|------------------|--------------------------------------|-----------------|-------------------------------|--|
| Phenol | 108-95-2 | Neurotoxicity | Guinea pigs | Inhalation | Vapor | 7 hours/day, 5 days/week for 74 days | 26 ppm | 12/group; sex not reported | Inadequate controls. Sex of animals not known. Insufficient test concentrations. |
| Phenol | 108-95-2 | Neurotoxicity | Rats | Oral | Gavage | 1 exposure | 207 mg/kg | Males, number not reported | Twitching around the eyes and ear muscles immediately after exposure, followed by convulsions and coma. Violent tonic spasms of the whole body persisted for 15 to 30 minutes. |
| Phenol | 108-95-2 | Neurotoxicity-acute and subchronic | Not reported | Inhalation | Not reported | Not reported | Not reported | Results are not yet reported. | Adequate deterrence testing |
| Phenol | 108-95-2 | Neurotoxicity - Summary | | | | | | | |
| | | | | | | | | | Adequate testing 1989 |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study |
|---------------|------------|---|--------------|-------------------------|------------------|---------------------|-------------------------------|---------------------------------|---|-------------------------------------|
| Phenol | 108-95-2 | Developmental toxicity | Rats | Oral | Gavage | Gestation days 6-15 | 0, 30, 60, and 120 mg/kg/day | 20 to 22 pregnant females/group | No statistically significant signs of maternal toxicity were observed. There was an increased proportion of litters with resorption sites in the 30 and 60 mg/kg/day groups, but not in the 120 mg/kg/day group. A dose-related decrease in mean live fetal body weight was statistically significant at 120 mg/kg/day. | Adequate |
| Phenol | 108-95-2 | Developmental toxicity | Mice | Oral | Gavage | Gestation days 6-15 | 0, 70, 140, and 280 mg/kg/day | 5 to 27 pregnant females/group | Dose-related decreased maternal weight gain and fetal growth retardation and an apparent, though not statistically significant, dose-related increase in cleft palate were observed. | Adequate |
| Phenol | 108-95-2 | Developmental toxicity | Not reported | Oral | Gavage | Not reported | Not reported | Not reported | Results are not yet reported. | Adequate deter (ATSDR is cur- |
| Phenol | 108-95-2 | Developmental toxicity - Summary | | | | | | | | |

Table of Toxicity Data for HAPs (continued)

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Table of Toxicity Data for HAPs (continued)

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Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study |
|-------------------------------|------------|--------------------------|---------|-------------------------|------------------|--|-----------------------------------|-------------------------------|---|
| Epidemiology - Summary | | | | | | | | | |
| Diethanolamine | 111-42-2 | Acute toxicity | Rats | Inhalation | Vapor or aerosol | Short-term (no further information provided) | 200 ppm vapor or 1400 ppm aerosol | Not reported | Respiratory difficulties and some deaths occurred (no further information provided). |
| Diethanolamine | 111-42-2 | Acute toxicity - Summary | | | | | | | Adequate information located. |
| Diethanolamine | 111-42-2 | Range-finding test | Rats | Inhalation | Not reported | Continuous exposure for 9 days | 0 or 25 ppm | Not reported | Increased liver weight, elevated SGOT, increased kidney weight, and elevated BUN were noted. |
| Diethanolamine | 111-42-2 | Subchronic toxicity | Rats | Inhalation | Not reported | A "workday schedule" for 13 weeks | 0 or 6 ppm | Not reported | Effects included depression of growth rate, increased lung and kidney weights, and some deaths among male rats. |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study |
|--------------------------------------|------------|---------------------|-----------------------------|-------------------------|------------------|--------------------------------------|--|--|--|
| Diethanolamine | 111-42-2 | Subchronic toxicity | Rats, guinea pigs, and dogs | Inhalation | Vapor | 6 hours/day, 5 days/week for 9 weeks | 0 or 0.5 ppm | 10 rats, 6 guinea pigs, 3 dogs/exposure group; all males | This inadu durat was days |
| Diethanolamine | 111-42-2 | Subchronic toxicity | Rats, guinea pigs, and dogs | Inhalation | Vapor | Continuous for 90 days | 0 or 0.26 ppm | 10 rats, 5 guinea pigs, 2 dogs/sex/exposure group; all males | No signs of toxicity were noted. Histopathological examination of a wide variety of tissues including sections of the cerebrum, cerebellum, and eye showed no lesions. |
| Diethanolamine | 111-42-2 | Subchronic toxicity | Rats, guinea pigs, and dogs | Inhalation | Vapor | Continuous for 90 days | 0 or 0.26 ppm | 10 rats, 5 guinea pigs, 2 dogs/sex/exposure group; all males | No toxicity was observed in guinea pigs or dogs; equivocal histological evidence of slight lung effects in rats. |
| Diethanolamine | | | | | | | | | |
| Subchronic toxicity - Summary | | | | | | | | | |
| Diethanolamine | 111-42-2 | Chronic toxicity | Skin painting assay | Not reported | Topical | Not reported | Not reported | Not reported | No data located on this compound |
| Diethanolamine | 111-42-2 | Carcinogenicity | | | | | | | No data located on this compound |
| Chronic toxicity - Summary | | | | | | | | | |
| Carcinogenicity - Summary | | | | | | | | | |
| Diethanolamine | 111-42-2 | Neurotoxicity | Rats | Oral | Drinking water | 13 weeks | 0, 0.16, 0.32, 0.63, 1.25, 2.5, and 5.0 mg/mL (doses were 28-288 mg/kg for males and 15-240 mg/kg for females) | 10/sex/exposure level | Demyelination of brain and spinal cord at 2.5 and 5.0 mg/mL. |
| Diethanolamine | 111-42-2 | Neurotoxicity | Rats | Oral | Drinking water | 13 weeks | 0, 0.16, 0.32, 0.63, 1.25, 2.5, and 5.0 mg/mL (doses were 28-288 mg/kg for males and 15-240 mg/kg for females) | 10/sex/exposure level | Demyelination of brain and spinal cord at 2.5 and 5.0 mg/mL. |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study design |
|--------------------------------|------------|---|---------|-------------------------|------------------|------------------------------|---------------------|---------------------------------|--|
| Neurotoxicity - Summary | | | | | | | | | |
| Diethanolamine | 111-42-2 | Chernoff/Kavlock post-natal mouse screening test | Mice | Oral | Gavage | Daily on gestation days 6-15 | 0 and 450 mg/kg/day | 50 mated females/group | No maternal toxicity, despite exposure to the predicted LD ₅₀ . Developmental toxicity occurred (decreased neonatal survival, p=0.001, increased gestation length, p<0.001) and neonatal weight gain, p≤0.001). |
| Diethanolamine | 111-42-2 | Chernoff/Kavlock preliminary developmental toxicity | Mice | Oral | Gavage | Daily on gestation days 6-15 | 450 mg/kg/day | 34/exposure level | No maternal toxicity. Developmental toxicity was noted (decreased number of viable litters, percent survival of pups, and weight gained by pups). |
| Diethanolamine | 111-42-2 | Developmental toxicity - Summary | | | | | | Additional diet suggests a high | |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study identifier |
|----------------|------------|---------------------------------|---------|-------------------------|------------------|----------|--|-------------------------------|--|---|
| Diethanolamine | 111-42-2 | Subchronic toxicity | Rats | Oral | Drinking water | 13 weeks | 0, 0.16, 0.32, 0.63, 1.25, 2.5, and 5.0 mg/mL (doses were 28-288 mg/kg for males and 15-240 mg/kg for females) | 10/sex/exposure level | Atrophy of the prostate at 5.0 mg/mL; atrophy of seminal vesicle, hypospermia in the epididymis, and spermatocyst arrest in the testis at 2.5 and 5.0 mg/mL. | This study identifies reprotoxic effects. |
| Diethanolamine | 111-42-2 | Reproductive toxicity - Summary | | | | | | | | Aval. repro. avail. toxic. diet. |
| Diethanolamine | 111-42-2 | Pharmacokinetics - Summary | | | | | | | | The intratracheal route. |

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Table of Toxicity Data for HAPs (continued)

(1990).

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study TSC |
|--------------------------------------|------------|-------------------------------|---------|-------------------------|------------------|---------------------------------------|------------------|-------------------------------|---|-------------------|
| Epidemiology - Summary | | | | | | | | | | |
| 1,2,4-Trichlorobenzene | 120-82-1 | Acute toxicity | Rats | Inhalation | Vapor | 4 hours, then observed for 14 days | 418 ppm | 6 males | No mortality; lacrimation, salivation, pink ears, labored breathing, and coordination were observed; body weights decreased 16%, then recovered normally. | No effects TSC |
| 1,2,4-Trichlorobenzene | 120-82-1 | Acute toxicity - Summary | | | | | | | | Data made |
| Subchronic toxicity - Summary | | | | | | | | | | |
| 1,2,4-Trichlorobenzene | 120-82-1 | Subchronic toxicity | Rats | Inhalation | Vapor | 7 hours/day, 5 days/week for 44 days | 0.30, or 100 ppm | 20 males/exposure group | Increased urinary excretion of porphyrin at 30 and 100 ppm; no gross or histologic effects. | This since animal |
| 1,2,4-Trichlorobenzene | 120-82-1 | Subchronic toxicity | Rats | Inhalation | Vapor | 6 hours/day, 5 days/week for 3 months | 0, 3, and 10 ppm | 10-26/sex/ exposure group | Increased urinary excretion of porphyrin at 10 ppm. | A little paraexam |
| 1,2,4-Trichlorobenzene | 120-82-1 | Subchronic toxicity - Summary | | | | | | | | Subsequent TSC |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Response | Study |
|------------------------|------------|------------------|---------|-------------------------|------------------|----------------------------------|------------------------|----------------|---|
| 1,2,4-Trichlorobenzene | 120-82-1 | Chronic toxicity | Rats | Inhalation | Vapor | Continuous exposure for 26 weeks | 0, 25, 50, and 100 ppm | 30 males/group | No effects were noted on survival, body weight, ophthalmic condition, hematological or serum biochemistry, pulmonary function or operant behavior. Histopathological examination revealed transient mild hepatomegaly and vacuolation in liver parenchymal cells, and hyaline degeneration in the renal cortex in all test groups at 4 and 13 weeks of exposure. These changes were not apparent at 26 weeks of exposure. |
| 1,2,4-Trichlorobenzene | 120-82-1 | Chronic toxicity | Rabbits | Inhalation | Vapor | Continuous exposure for 26 weeks | 0, 25, 50, and 100 ppm | 16 males/group | No effects were noted on survival, body weight, ophthalmic condition, hematological or serum biochemistry, pulmonary function, operant behavior or histopathology at the end of the exposure period. Interim sacrifices were not conducted on these animals. |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study |
|------------------------|------------|----------------------------|---------------|-------------------------|------------------|---|-------------------------|-------------------------------------|---|
| 1,2,4-Trichlorobenzene | 120-82-1 | Chronic toxicity | Monkeys | Inhalation | Vapor | Continuous exposure for 26 weeks | 0, 25, 50, and 100 ppm | 9 males/group | Inadult male trichlorobenzene 1977/1987 |
| 1,2,4-Trichlorobenzene | 120-82-1 | Chronic toxicity - Summary | | | | | | | |
| 1,2,4-Trichlorobenzene | 120-82-1 | Carcinogenicity | Rats and Mice | Oral | Dietary | Not reported | Not reported | Results are not reported yet. | This program 6/94 |
| 1,2,4-Trichlorobenzene | 120-82-1 | Carcinogenicity - Summary | | | | | | | |
| 1,2,4-Trichlorobenzene | 120-82-1 | Locomotor activity | Rats | Oral | Drinking water | Continuously from birth through 2 generations | 0, 25, 100, and 400 ppm | 17-23/sex/exposure group/generation | No differences were observed in the number of photocells interrupted during 45 minutes in residential maze activity measurements. |
| 1,2,4-Trichlorobenzene | 120-82-1 | Operant behavior | Monkeys | Inhalation | Vapor | Continuous exposure for 26 weeks | 0, 25, 50 and 100 ppm | 9 males/group | No effects were observed in operant behavior |
| | | | | | | | | | Inadult small male were limit paraevalu |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study |
|------------------------|------------|--|---------|-------------------------|------------------|---|-------------------------------------|-------------------------------------|--|
| 1,2,4-Trichlorobenzene | 120-82-1 | Neurotoxicity - Summary | | | | | | | |
| 1,2,4-Trichlorobenzene | 120-82-1 | Developmental toxicity | Rats | Oral | Gavage | Daily on gestation days 6-15 | 0, 75, 150, and 300 mg/kg/day | 11-14/exposure level | Adequate trichlorobenzene studies were available. |
| 1,2,4-Trichlorobenzene | 120-82-1 | Chernoff-Kavlock post-natal screening test | Rats | Oral | Gavage | Daily on gestation days 9-13 | 0, 36, 120, 360, and 1200 mg/kg/day | 6 or more/ exposure level | Mortality and reduced body weight gain was observed in dams at 360 and 1200 mg/kg; retarded embryonic development was observed at 360 mg/kg. |
| 1,2,4-Trichlorobenzene | 120-82-1 | Developmental toxicity - Summary | | | | | | | |
| 1,2,4-Trichlorobenzene | 120-82-1 | Reproductive toxicity | Rats | Oral | Drinking water | Continuously from birth through 2 generations | 0, 25, 100, and 400 ppm | 17-23/sex/exposure group/generation | Enlarged adrenals in adults; no reproductive toxicity. |
| 1,2,4-Trichlorobenzene | 120-82-1 | Reproductive toxicity - Summary | | | | | | | |
| | | An adequate study was available. | | | | | | | |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study |
|------------------------|------------|-----------------------------------|---------|-------------------------|------------------|----------|-----------------|-------------------------------|-----------------|
| 1,2,4-Trichlorobenzene | 120-82-1 | Pharmacokinetics - Summary | | | | | | | Pharm anim 1992 |

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Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Response | Study |
|---------------|------------|-----------------------------|---------|-------------------------|------------------|--|--|--|--|
| Chloroprene | 126-99-8 | Epidemiology (Case studies) | Humans | Not specified | Occupational | In 1 study, 6-10 years of exposure; in the second study, the exposure period was not reported. | Precise levels were not given for either study in this review, but the level in 1 of the studies was reportedly "several times higher" than 2 mg/m ³ (0.6 ppm). | Spermatogenesis "disturbances," increased incidence of spontaneous abortion in exposed workers' wives, and sexual impotency were observed. | This review data from studies involving insurmountable evaluations was adequate. |
| Chloroprene | 126-99-8 | Epidemiology (Case studies) | Humans | Inhalation | "Fumes" | Exposure periods ranged from 2 weeks to 4 years. | Workers were exposed to fumes of heated chloroprene-based rubber; air concentration of chloroprene was not reported. | Eosinophilia and acute respiratory illness of varying severity were common to all 5 cases, and ceased when exposure ended. Individuals also experienced delirium, fever, headache, chills, sweating, and conjunctivitis during the period of exposure. Chronic productive cough after cessation of exposure was also reported. | This case series occurred exposure in industrial epidemic. |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Response | Study |
|---------------|------------|-----------------------------|---------|-------------------------|------------------|--|-----------------|---|--|
| Chloroprene | 126-99-8 | Epidemiology (Cohort study) | Humans | Not specified | Occupational | Workers were exposed during the period 1956-1970 | Not reported | 25,000 workers, divided into 5 groups: 1 group (684) with prolonged production exposure, 1 group (2250) with chloroprene derivative exposure, and 3 unexposed groups. | The skin cancer rate was significantly increased over controls (0.13%) in production workers (3.07%) and workers exposed to derivatives (rate not reported). This inad epidd Othe whic may expo repo abou canc conc not i Inten durat were descri revie |
| Chloroprene | 126-99-8 | Epidemiology (Cohort study) | Humans | Not specified | Occupational | Workers were exposed during the period 1956 - 1970 | Not reported | 20,000 workers, divided into 4 groups: 1 group (2934) with some exposure to chloroprene or its derivatives, and 3 unexposed groups. | The incidence of lung cancer in exposed workers (1.24%) was significantly higher than in the 3 control groups (0.46%, 0.8%, and 0.06%). This inad epidd Othe expo detai smol types work and e conci not ru revie |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Response | Study |
|---------------|------------|-----------------------------------|---------|-------------------------|------------------|--|---|--|--|
| Chloroprene | 126-99-8 | Epidemiology (Cohort study) | Humans | Not specified | Occupational | 2 cohorts from 2 different production plants were examined: 1 was first exposed between 1931 and 1948 and the other between 1942 and 1957. | "High, moderate, low, or varied" exposures were categorized according to occupation | 2 cohorts comprised of 1576 and 270 male production workers; 2 control groups (the controls groups were DuPont Company male wage roll employees and retirees and U.S. males) | No chloroprene-related difference was observed between exposed cohorts and control groups with respect to the incidence of mortality due to lung cancer. |
| Chloroprene | 126-99-8 | Epidemiology (Case-control study) | Humans | Not specified | Occupational | 3 to 23 years | Only reported in terms of high or low exposures | 55 cases (deaths from cancer; all males) and 54 matched controls (matched according to sex, age at death, and date of death) | This epidemic is limited to Quantitative level "low" occurrence not reported. |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study |
|---------------|------------|-----------------------------|---------|-------------------------|------------------|---|---|--|---|
| Chloroprene | 126-99-8 | Epidemiology (Cohort study) | Humans | Not specified | Occupational | Mean durations were 16.9 ± 1.2 years for males and 15 ± 1.8 years for females | Only reported in terms of high or low exposures | 1213 workers (955 males and 258 females) | This epidemic is limited to Quartile level "low" occur not reported. |
| Chloroprene | 126-99-8 | Epidemiology - Summary | | | | | | | One et al. conc. chloro. respi. repro. |
| Chloroprene | 126-99-8 | Acute toxicity | Rats | Inhalation | Vapor | 4 hours, followed by a 24-hour observation period | 0, 100, 150, 225, and 300 ppm | Fasted adult males were tested; 13-14 in the exposed group and 24 in the control group | Acute hepatotoxicity was reported, manifest by increased GSH, serum sorbitol dehydrogenase, and serum lactate dehydrogenase at 250 ppm and above, and increased relative liver weight at 150 ppm and above. |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study |
|---------------|------------|----------------|---------|-------------------------|------------------|--|---|--------------------------------------|---|
| Chloroprene | 126-99-8 | Acute toxicity | Rats | Inhalation | Vapor | one 4-hour exposure followed by a 24-hour observation period | 0, 500, 1000, 2000, and 4600 ppm | 5 fed or fasted males/exposure level | Fasted rats had elevated serum AKT at all exposure levels; fed rats had elevated serum AKT only in the high exposure group. Mortality was observed (up to 3/5) in each treated group among the fasted rats; no mortality was observed among fed rats except in the high exposure group. |
| Chloroprene | 126-99-8 | Acute toxicity | Rats | Inhalation | Vapor | 4 hours, followed by a 14-day observation period | 0, 1.95, 6.24, 8.42, 13.04, and 13.30 mg/L (0, 528, 1723, 2325, 3601, and 3673 ppm) | 6 males/exposure level | The treatment killed 0/6, 0/6, 1/6, 2/6, and 2/6 animals from the lowest to highest exposure levels, respectively. Labored respiration and pallor were observed at all but the lowest exposure levels. Histopathological evidence of severe damage was observed in the lungs and liver in animals that lived or died. |
| Chloroprene | 126-99-8 | Acute toxicity | Rats | Inhalation | Vapor | 1 hour, followed by a 48-hour observation period | 57.5 or 72.4 mg/L (15878.42 or 19933.0 ppm) | 10 males | 5 of 10 rats in the high-exposure level group died, all after 6 days post-exposure. Clinical signs during exposure included irregular respiration, red ears, lacrimation, head tremors, and incoordination of the front legs. |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study |
|--------------------|------------|---------------------------------|---------|-------------------------|------------------|--------------------------------------|--------------------------|---|---|
| Chloroprene | | | | | | | | | |
| | 126-99-8 | Acute toxicity - Summary | | Rats | Inhalation | Vapor | 8 hours/day for 5 months | 56 and 334 ppm | 10 males/exposure group and 6 male controls |
| Chloroprene | 126-99-8 | Subchronic toxicity | Rats | Inhalation | Vapor | 8 hours/day for 5 months | 56 and 334 ppm | 10 males/exposure group and 6 male controls | This chloro effect inadd is ap ther chlon subcl stud few were were |
| Chloroprene | 126-99-8 | Subchronic toxicity | Rats | Inhalation | Vapor | 6 hours/day, 5 days/week for 4 weeks | 0, 39, 162, and 630 ppm | 10/sex/exposure level | Mortalities occurred at mid- and high-doses, and decreased body weight occurred at all levels. Concentration-related increases were observed in relative weights of kidneys, liver, and lungs. Centrilobular liver degeneration and necrosis were observed in 10/10 males and 8/10 females only in the high-exposure group. Slightly enlarged renal tubular epithelial cells were also observed only in high-exposure level rats. |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Response | Study reference |
|---------------|------------|---------------------|----------|-------------------------|------------------|---|-------------------------------|-----------------------|--|
| Chloroprene | 126-99-8 | Subchronic toxicity | Hamsters | Inhalation | Vapor | 6 hours/day, 5 days/week for 4 weeks | 0, 39, 162, and 630 ppm | 10/sex/exposure level | This inadquate subacute assay of exerts insult |
| Chloroprene | 126-99-8 | Subchronic toxicity | Rats | Inhalation | Vapor | 6 hours/day, 5 days/week for 13 or 26 weeks | 0, 9, 8, 32, 4, or 100.2 ppm | 40/sex/exposure group | Changes in relative liver, kidney, and adrenal weights; these effects were not considered adverse because of a lack of histopathological effects in these organs. |
| Chloroprene | 126-99-8 | Subchronic toxicity | Rats | Inhalation | Vapor | 6 hours/day, 5 days/week for 13 weeks | 0, 5, 12, 32, 80, and 200 ppm | 40/sex/exposure group | One high-dose male died. Effects were noted on hematopoietic system, along with slight hepatocellular necrosis and hemosiderosis in liver at 200 ppm; degeneration and metaplasia of the olfactory epithelium and suppurative inflammation at 80 and 200 ppm were also reported. Degeneration of the nasal olfactory epithelial lining occurred at 32 ppm and higher. Possible exposure-related minimal suppurative gastritis in the forestomach of high-exposure rats was seen. |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study |
|-----------------|------------|--------------------------------------|---------|-------------------------|------------------|---------------------------------------|--|-------------------------------|--|
| Chloroprene | 126-99-8 | Subchronic toxicity | Mice | Inhalation | Vapor | 6 hours/day, 5 days/week for 13 weeks | 0, 5, 12, 32, and 80 ppm | 30/sex/exposure group | Minimal or slight focal, multifocal, or diffuse epithelial hyperplasia in the forestomach at 80 ppm; small focal areas of pulmonary hemorrhage were observed in 1/10, 2/10, or 3/10 mice at 12, 32, and 80 ppm, respectively. |
| Chloroprene | 126-99-8 | Subchronic toxicity - Summary | | Hamsters | Inhalation | Vapor | 6 hours/day, 5 days/week for 18 months | 0, 10, or 50 ppm | 100/sex/exposure group |
| Adequate | | | | | | | | | |
| Chloroprene | 126-99-8 | Chronic toxicity | | | | | | | Slight growth retardation, increased relative brain and lung weights, decreased relative spleen weight were observed at 50 ppm; no adverse effects were seen at 10 ppm. Histopathological examination did not reveal effects clearly associated with exposure. |
| Chloroprene | 126-99-8 | Chronic toxicity | Rats | Inhalation | Vapor | 6 hours/day, 5 days/week for 2 years | 0, 10, or 50 ppm | 100/sex/exposure group | Alopecia, growth retardation, increased lymphoid aggregates in lungs, and increased foci of cellular alterations in the liver were observed at 50 ppm. Increased relative liver weights were observed at 10 and 50 ppm. |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study organ |
|-----------------------------------|------------|-----------------|----------|-------------------------|------------------|--|---|---|--|
| Chronic toxicity - Summary | | | | | | | | | |
| Chloroprene | 126-99-8 | Carcinogenicity | Rats | Oral | Gavage | Once on gestation day 17; 1 time/ week for life after weaning. Survivors were sacrificed at 120 weeks. | 0 or 50 mg/kg in olive oil | Treated rats: 17 pregnant females and 8 male and 64 female offspring. | Total incidence of tumors was reportedly "similar" between treated and control groups. |
| Chloroprene | 126-99-8 | Carcinogenicity | Rats | Oral | Gavage | Vehicle control rats: 14 pregnant females and their offspring (number not reported). | | | |
| Chloroprene | 126-99-8 | Carcinogenicity | Rats | Oral | Gavage | 2 doses/week, 2.5 weeks; then observed for 2 years. | 200 mg/kg/dose (control group not reported) | 100 rats (sex not reported) | 40/100 rats survived 2 years. No tumors were observed in survivors. |
| Chloroprene | 126-99-8 | Carcinogenicity | Hamsters | Inhalation | Vapor | 6 hours/day, 5 days/week for 18 months | 0, 10, or 50 ppm | 100/sex/exposure group | No evidence for carcinogenicity. |
| Chloroprene | 126-99-8 | Carcinogenicity | Rats | Inhalation | Vapor | 6 hours/day, 5 days/week for 2 years | 0, 10, or 50 ppm | 100/sex/exposure group | No evidence of carcinogenicity. |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study |
|---------------|------------|---------------------------|---------------|-------------------------|---------------------------|---------------------------------------|---|-------------------------------|--|--|
| Chloroprene | 126-99-8 | Carcinogenicity | Mice | Inhalation | Vapor (static conditions) | 4 hours/day, 6 days/week for 7 months | 0, 3, 20, and 190 mg/m ³ (0, 0.8, 5.5, and 52.5 ppm) | 77 to 132/exposure group | Dose-related increases in the incidence of lung tumors (8.1% in the low-dose group) and number of lung tumors (primarily papilladenomas and adenomas) per mouse were reported (trends were not statistically evaluated). | This assay with identification of sex and number of tumors examined, tumor exposure and post-exposure observation. |
| Chloroprene | 126-99-8 | Carcinogenicity | Mice and rats | Inhalation | Not reported | Not reported | Not reported | Not reported | Nasal, liver, and kidney effects were seen in rats. There were no effects on the lungs of the rats. No effects were noted in the respiratory tract of mice. | Only NTP available. It is a mouse histopathology done study. |
| Chloroprene | 126-99-8 | Carcinogenicity - Summary | | | | | | | No specific information available. | |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Response | Study | |
|---------------|------------|--------------------------------|---------|-------------------------|------------------|---------------------------------------|-----------------------------------|-----------------------|--|---|
| Chloroprene | 126-99-8 | Neurotoxicity | Rats | Inhalation | Vapor | 6 hours/day, 5 days/week for 13 weeks | 0, 5, 12, 32, 80, and 200 ppm | 10/sex/exposure group | No neurobehavioral effects were observed during a 4-day evaluation period during week 11; parameters measured included residential maze, grip strength, tail flick, and startle response. No brain neuropathology was observed at completion of the study; gross and histopathological examination of the brain included a look at sections through frontal cortex and basal ganglia, parietal cortex and thalamus, and cerebellum and pons. | |
| Chloroprene | 126-99-8 | Neurotoxicity - Summary | | | | | | | Inadequate chloroform for n | |
| Chloroprene | 126-99-8 | Developmental toxicity | Rats | Inhalation | Vapor | 6 hours/day on gestation days 4-16 | 0, 10, 3, 24, 7, 73.5, or 171 ppm | 27-31/exposure level | Decreased body weight gain in dams exposed to 3 highest concentrations. Numerous developmental effects were observed at 73.5 and 171 ppm. | |
| Chloroprene | 126-99-8 | Developmental toxicity | Rats | Inhalation | Vapor | 4 hours/day on gestation days 1-16 | 0, 1, 10, or 25 ppm | 25/exposure level | No maternal or developmental toxicity. | This inadequate of im expo and signs were |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Response | Study |
|---------------|------------|------------------------|---------|-------------------------|------------------|--|---|-----------------------|---|
| Chloroprene | 126-99-8 | Developmental toxicity | Rats | Inhalation | Vapor | 4 hours/day on gestation days 1-12 | 0, 1, 10, or 25 ppm | 50/exposure group | No maternal or developmental toxicity. |
| Chloroprene | 126-99-8 | Developmental toxicity | Rats | Inhalation | Vapor | 4 hours/day, gestation days 1-20 | 0, 0.6, or 4 mg/m ³ (0, 0.2, or 1.1 ppm) | 8 to 32 animals/group | At 4 mg/m ³ , decreased body weight gain, oxygen consumption, and spontaneous motor activity, and altered functional state of the liver (as indicated by increased urinary content of hippuric acid) were observed in pregnant dams. In a group of non-pregnant females exposed to this level, only spontaneous motor activity was altered. Dams exposed to 0.6 mg/m ³ developed hypotension, but non-pregnant females did not. |
| Chloroprene | 126-99-8 | Developmental toxicity | Rabbits | Inhalation | Vapor | 6 hours/day, 7 days/week on days 6-28 of gestation | 0, 10, 40, or 175 ppm | 16 females/group | No effects were noted on the number of implantations, live pups/litter, or resorptions. There were no signs of fetal or maternal toxicity and fetal body, kidney and liver weights were not affected. |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/ exposure level | Study on the limits of deve lution |
|---|------------|--|---------|-------------------------|------------------|---|---|--|--|
| Developmental toxicity - Summary | | | | | | | | | |
| Chloroprene | 126-99-8 | Reproductive toxicity | Rats | Inhalation | Vapor | 6 hours/day, 5 days/week for 13 weeks (F_0) or 10 weeks (F_1) | 0, 10, 33, or 100 ppm (F_1) rats were exposed to the same concentrations as F_0 rats. | 25/sex/group (F_0); 40/sex/group (F_1) | Growth retardation was observed among 100 ppm F_0 rats and among 33 and 100 ppm F_1 rats. All F_0 and F_1 rats were normal with respect to general condition and behavior; F_0 rats were normal with respect to reproductive performance (not examined in F_1 rats). |
| Chloroprene | 126-99-8 | Reproductive toxicity (male fertility test) | Rats | Inhalation | Vapor | 4 hours/day for 22 days | 0 or 25 ppm | 5 males/group | No changes were observed in the number of offspring and average body weight at weaning of the offspring of treated males (mated with untreated females after exposure). No gross or histopatho-logical changes were observed in reproductive organs of the treated males. |
| Chloroprene | 126-99-8 | Subchronic toxicity (with reproductive evaluation) | Rats | Inhalation | Vapor | 4.5 months; exposure schedule not reported | 0, 0.051, 0.15, or 1.69 mg/m ³ (0, 0.01, 0.04, or 0.5 ppm) | 8 males/group | Testicular atrophy, and effects on spermatogonia, sperm motility, and sperm viability were reported in rats at the 2 highest concentrations, but not in the low-concentration or control rats. |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study Response |
|---------------|------------|--|---------|-------------------------|------------------|--|--|-------------------------------|--|
| Chloroprene | 126-99-8 | Reproductive toxicity | Mice | Inhalation | Vapor | 2 months; exposure schedule not reported | 0.054, 0.064, 0.13, 0.32, 1.85, and 35 mg/m ³ (0.01, 0.02, 0.04, 0.09, 0.5, and 9.7 ppm) (control group not reported) | 8 males/group | Testicular atrophy and desquamation of germinal epithelium and an increased number of tubules were reported in mice at ≥0.32 mg/m ³ . |
| Chloroprene | 126-99-8 | Reproductive toxicity - Summary | | | | | | | Inaddition from expo findings in 1991 review in man orally. |
| Chloroprene | 126-99-8 | Pharmacokinetics - Summary | | | | | | | Limited orally. |

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Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study System |
|-------------------------------|------------|-------------------------------|---------|-------------------------|---------------------|--------------|---|---|--|----------------------------------|
| Epidemiology - Summary | | | | | | | | | | |
| Carbonyl sulfide | 463-58-1 | Acute toxicity | Rats | Inhalation | Whole-body exposure | 4 hours | 0, 804, 993, 1062, 1096, 1147, and 1189 ppm | 6/sex/group | LC ₅₀ was 1,082 ppm; lowest mortality level was 1062 ppm. Central nervous system dysfunction (convulsions, tremors, and behavioral abnormalities) at 1062 and 1189 ppm; body weight loss at 1062. | Adequate information available |
| Carbonyl sulfide | 463-58-1 | Acute toxicity | Mice | Inhalation | Not reported | Not reported | Not reported | LC ₅₀ was 2900 ppm. | Not available | Inadequate information available |
| Carbonyl sulfide | 463-58-1 | Acute toxicity | | | | | | | | |
| Carbonyl sulfide | 463-58-1 | Subchronic toxicity - Summary | | | | | | | | |
| Carbonyl sulfide | 463-58-1 | Chronic toxicity - Summary | | | | | | | | |
| Carbonyl sulfide | 463-58-1 | Carcinogenicity - Summary | | | | | | | | |
| Carbonyl sulfide | 463-58-1 | Neurotoxicity | Rabbits | Inhalation | Continuous exposure | 7 weeks | 0 and 50 ppm | 35 females (18 in experimental group and 17 controls) | Increased serum cholesterol concentration was noted in the exposed rabbits. Three rabbits died after 5 days of exposure and 2 had serious symptoms of intoxication from the central nervous system. | Inadequate information available |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study sufficiency |
|---|------------|--|---------|-------------------------|---------------------|--|---|----------------------------------|--|
| Carbonyl sulfide | 463-58-1 | Neurotoxicity | Rats | Inhalation | Whole-body exposure | 4 hours | 0, 804, 993, 1062, 1096, 1147, and 1189 ppm | 6/sex/group | In addition to these reproductive effects, convulsions, tremors, and behavioral abnormalities were noted at 1062 and 1189 ppm. |
| Carbonyl sulfide | 463-58-1 | Neurotoxicity - Summary | | | | | | | |
| Developmental toxicity - Summary | | | | | | | | | |
| Carbonyl sulfide | 463-58-1 | One-generation reproductive toxicity | Rats | Inhalation | Vapor | Continuous exposure for 7 days pre-mating and during mating, followed by 6 hours/day, 5 days/week for approximately 13 weeks | 0, 10, 60, and 180 ppm | Parent generation = 24/sex/group | Reduced pregnancy of untreated females mated with high-dose males; no effect on reproductive indices in treated females mated with untreated males. Subsequent testing with treated males given a recovery period and then mated with new females showed no effects on reproductive indices. |
| Carbonyl sulfide | 463-58-1 | Reproductive toxicity - Summary | | | | | | | |
| Carbonyl sulfide | 463-58-1 | Pharmacokinetics - Summary | | | | | | | |
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Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Animals/ exposure level | Response | Study Health |
|---------------|------------|---|---------|-------------------------|---|--------------|---|-------------------------------------|--|--------------------------------------|
| Cresol | 1319-77-3 | Epidemiology (Cross-sectional health study) | Humans | Occupational | Exposure to coal tar and its products | Not reported | Not quantified | 453 workers (108 males; 45 females) | The only significant findings were abnormal skin conditions (tar warts, folliculitis, keratosis, chloracne) were noted and appeared to be related to coal tar exposure. Restrictive deficits in pulmonary function tests appeared to be related to smoking habits and age. Sputum and urine cytology, chest x-ray, and C-reactive protein analyses revealed no evidence of cancer. | Exposures mixed subsists the v data. |
| o-Cresol | 95-48-7 | Irritation threshold | Humans | Inhalation | Experimental exposure to vapor and/or aerosol | Not reported | Range of test concentrations not reported. | 10 | Eight of ten subjects sensed irritation (dryness, constriction in the nose, irritation of the throat, and a taste in the mouth) upon inhalation of a concentration of 6 mg/m ³ (1.4 ppm). | Inadequate of in design and i |
| Cresol | 1319-77-3 | Epidemiology - Summary | | | | | | | | |
| o-Cresol | 95-48-7 | Acute toxicity | Rats | Inhalation | Vapor | 6 hours | 0, 0.2, 2.0, and 20.0 mg/L (0, 45.2, 452.2, and 4521.8 ppm) | 5/sex/exposure level | LC ₅₀ >20 mg/L. No mortalities were observed. Eye irritation was noted during exposure (exposure level not reported), but cleared up within 24 hours post-exposure. | Although is pre sum it app adeq |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Animals/ exposure level | Response | Study |
|---------------|------------|----------------------|---------|-------------------------|----------------------|--------------|--|---|---|--|
| o-Cresol | 95-48-7 | Acute toxicity | Mice | Inhalation | Vapor and aerosol | Not reported | Not reported | Not reported | The mean lethal concentration was 178 mg/m ³ (40 ppm). Toxic signs included irritation of mucous membranes, muscular twitching and weakness, clonic convulsions, and hematuria. Major histologic findings included irritation and inflammation of the respiratory tract; bronchopneumonia; centrilobular necrosis in the liver; and edema and swelling of glomeruli, degeneration of the tubular epithelium, and perivascular hemorrhages in the kidney. | This inad- toxic becau- expe- meth- poor- the n- anim- speci- of the perioc- speci- repot- inadd- NOA- estab- |
| o-Cresol | 95-48-7 | Irritation threshold | Cats | Inhalation | Vapor and/or aerosol | Not reported | Range of test concentrations not reported. | Not reported | The threshold that produced irritation of the mucosa, as determined by gravimetric measurement of salivary gland secretions, was 5-9 mg/m ³ (1.1-2.0 ppm). | Inadd- of in- desc- design and 1- |
| m-Cresol | 108-39-4 | Acute toxicity | Rats | Inhalation | Vapor or mist | 8 hours | Saturated vapor or mist (not quantified) | 6/ ^a exposure (sex not reported) | No effects were noted on survival. One rat exposed to the mist failed to gain weight. No other effects were reported. | This by us anim- expo- |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Animals/ exposure level | Response | Study acute | |
|--|-----------------------------------|---------------------------------|------------------|-------------------------|------------------|----------|--|----------------------------|---|--------------------|--|
| o-Cresol | 95-48-7 | Acute toxicity | Mink and ferrets | Oral | Diet | 28 days | 0, 240, 432, 778, 1400, and 2520 ppm for mink 0, 432, 778, 1400, 2520, and 4536 ppm for ferrets | 5/sex/exposure group | No significant differences were seen in mink organ weight. Ferrets had a significant increase in liver weight at 1400 ppm and higher, and kidney weight in females at 4536 ppm. | This by the animal | |
| o-, m-, p-, and m/p-Cresol | 95-48-7, 108-39-4, 106-44-5 | Acute toxicity | Rats and mice | Oral | Diet | 28 days | 0, 300, 1000, 3000, 10,000, or 30,000 ppm | 5/sex/exposure group | Increased relative liver weights were noted. p- and m/p-cresol exposure resulted in atrophy and regenerative changes in the nasal epithelial and forestomach. | This an acute | |
| Cresol | 1319-77-3 | Acute toxicity - Summary | | | | | | | | | |
| o-Cresol | | | | | | | | | | | |
| Subchronic toxicity | | | | | | | | | | | |
| Rats and mice | | | | | | | | | | | |
| Oral | | | | | | | | | | | |
| Diet | | | | | | | | | | | |
| 13 weeks | | | | | | | | | | | |
| Rats: 0, 1880, 3750, 7500, 15,000, and 30,000 ppm Mice: 0, 1250, 2500, 5000, 10,000, and 20,000 ppm | | | | | | | | | | | |
| m/p-Cresol | | | | | | | | | | | |
| Subchronic toxicity | | | | | | | | | | | |
| Rats and mice | | | | | | | | | | | |
| Oral | | | | | | | | | | | |
| Diet | | | | | | | | | | | |
| 13 weeks | | | | | | | | | | | |
| Rats: 0, 1880, 3750, 7500, 15,000, and 30,000 ppm Mice: 0, 625, 1250, 2500, 5000, and 10,000 ppm | | | | | | | | | | | |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Animals/ exposure level | Response | Study functionality evalu- ation appro- priate adeq- |
|---------------|------------|---------------------|---------|-------------------------|------------------|----------|-------------------------------|----------------------------|---|--|
| | | | | | | | | | | |
| o-Cresol | 95-48-7 | Subchronic toxicity | Rats | Oral | Gavage | 13 weeks | 0, 50, 175, and 600 mg/kg/day | 130 males and 130 females | Central nervous system depression was noted for high dose males and females. | Alth func evalu- ation appro- priate adeq- |
| m-Cresol | 108-39-5 | Subchronic toxicity | Rats | Oral | Gavage | 13 weeks | 0, 50, 150, and 450 mg/kg/day | 137 males and 135 females | Central nervous system depression and body weight reduction were noted in high dose males and females. | Alth func evalu- ation appro- priate adeq- |
| p-Cresol | 106-44-5 | Subchronic toxicity | Rats | Oral | Gavage | 13 weeks | 0, 50, 175, and 600 mg/kg/day | 158 males and 157 females | Central nervous system depression, mild anemia, and a reduction in body weight gain were noted in the mid- and high dose groups. p-Cresol was found to be hepatotoxic and nephrotoxic. Absolute liver and spleen weights were significantly decreased in high dose males. | Alth func evalu- ation appro- priate adeq- |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Animals/ exposure level | Response | Study |
|---------------|------------|---------------------|---------|-------------------------|-------------------|---|---|----------------------------|---|--|
| o-Cresol | 95-48-7 | Subchronic toxicity | Mice | Inhalation | Vapor and aerosol | 2 hours/day, 6 days/week for one month | 50 mg/m ³ (11 ppm) mean concentration, range from 26 to 76 mg/m ³ (6 to 17 ppm) | Not reported | Findings included decreased body weight gain; degeneration of central nervous system nerve cells and glial elements; respiratory tract hyperemia, edema, and cellular proliferation; bronchitis and small hemorrhages in the lung; degeneration of myocardial muscle fibers; and liver and kidney protein "dystrophy". No effects were noted on organ weights. | This inadquate study of in duration and exposure meth poor; the n and conc tested data inadquate NOA estab |
| o-Cresol | 95-48-7 | Subchronic toxicity | Rats | Inhalation | Vapor | 6 hours/day, 5 days/week for 2 months, then 4 hours/day, 5 days/week for an additional 2 months | 9 ± 0.9 mg/m ³ mean concentration (2 ± 0.2 ppm) | Not reported | Findings included reduction in a conditioned defensive reflex; hematologic alterations; change in the duration of hexenal narcosis; signs of upper respiratory tract irritation; inflammation, local edema, and perivascular sclerosis in the lungs; and excessive fluid, parenchymal degeneration, and swelling of the endothelium of the vessels in other internal organs. No changes were noted in kidney function, organ weights, or organ histology. | This inadquate study of in duration and exposure meth poor; the n and conc tested data inadquate NOA estab |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Animals/ exposure level | Response | Study |
|------------------|---------------------------------|-------------------------------|-----------------------------|-------------------------|------------------|---|--|---|--|--|
| o-Cresol | 95-48-7 | Subchronic toxicity | Guinea pigs | Inhalation | Vapor | 6 hours/day, 5 days/week for 2 months, then 4 hours/day, 5 days/week for an additional 2 months | 9 ± 0.9 mg/m ³ mean concentration (2 ± 0.2 ppm) | Not reported | Findings included hematologic changes; slightly altered EKG; increased excretion of phenols in the urine; signs of upper respiratory tract irritation; inflammation, local edema, and perivascular sclerosis in the lung; and excessive fluid, parenchymal degeneration, and swelling of the endothelium of the vessels in other internal organs. No changes were noted in the leukocyte:erythrocyte ratio, organ weights, or organ histology. | This inadequately studied study of in durat exp meth poor the n and d was only conc testes data inadq NOAA estab Russ and § because concord al., 1 and 1 |
| Cresol | 1319-77-3 | Subchronic toxicity - Summary | | | | | | | | No d Heal |
| o-, m-, p-Cresol | 95-48-7 108-39-5 106-44-5 | Chronic toxicity - Summary | Carcinogenicity (Promotion) | Mice | Dermal | Skin painting | Single initiation dose followed 1 week later by biweekly applications for 12 weeks | Initiation - 25 µL of a 0.3% solution of dimethylbenz-anthracene Promotion - 25 µL of a 20% solution of each cresol | 27-29 females/group | Number of surviving mice with papillomas were: o-cresol - 10/17 m-cresol - 7/14 p-cresol - 7/20 controls - 0/12. |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Animals/ exposure level | Response | Study Category |
|------------------|---------------------------------|----------------------------------|---------|-------------------------|------------------|--|---|----------------------------|---|---|
| m, p-Cresol | 108-39-5 106-44-5 | Carcinogenicity (Promotion) | Mice | Dermal | Skin painting | Single initiation dose followed 1 week later by biweekly applications for 20 weeks | Initiation - 25 μ L of a 0.3% solution of dimethylbenz-anthracene. Promotion - 25 μ L of a 5.7% cresol solution of each cresol | 20 females/group | Number of surviving mice with papillomas were: m-cresol - 4/17 p-cresol - 4/14 controls - 0/20. | Adeq paint altho adeq of ca |
| Cresol | 1319-77-3 | Carcinogenicity - Summary | | | | | | | | |
| o-Cresol | 95-48-7 | Neurotoxicity | Rats | Dermal | Intravenous | Continuous exposure for 15 minutes | approximately 0.9 mg/minute | 6 males | o-Cresol readily induced somatosensory evoked potential excitation. Involuntary muscle movements and tremors were produced. | Inadq only anim sex v canc |
| o-, m-, p-Cresol | 95-48-7 108-39-4 106-44-5 | Neurotoxicity | Rats | Oral | Gavage | Daily for 13 weeks | 0, 50, 175, and 600 mg/kg | 10/sex/dose level | Mortality was observed at 600 mg/kg of o- and p-cresols. Clinical observations indicative of neurotoxicity were observed for all 3 isomers at 50 mg/kg/day and higher and convulsions were observed at 600 mg/kg. No abnormalities were observed in performance on neurobehavioral test batteries or in gross or histopathological examination of nervous tissue. | This neuro |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Animals/ exposure level | Response | Study was done in 1992 |
|--------------------------------|------------|------------------------|---------|-------------------------|------------------|------------------------------|---------------------------|----------------------------|--|--|
| Neurotoxicity - Summary | | | | | | | | | | |
| Cresol | 1319-77-3 | Developmental toxicity | Rats | Oral | Gavage | Daily on gestation days 6-15 | 0, 30, 175, and 450 mg/kg | 25/exposure level | Maternal toxicity (mortality, decreased body weight gain, and clinical signs) and developmental toxicity (increased incidence of minor skeletal variations and dilated lateral ventricles) were observed at 450 mg/kg. | This study (deve toxic level evide mate) |
| o-Cresol | 95-48-7 | Developmental toxicity | Rabbits | Oral | Gavage | Daily on gestation days 6-18 | 0, 5, 50, and 100 mg/kg | 14/exposure level | Maternal toxicity (hypoactivity, audible respiration, and ocular discharge) were seen at mid- and high-dose levels. Increased incidence of ecchymosis on the head and poorly ossified sternbrae were seen in offspring at the high-dose level. | This study (deve toxic level evide mate) |
| p-Cresol | 106-44-5 | Developmental toxicity | Rats | Oral | Gavage | Daily on gestation days 6-15 | 0, 30, 175, and 450 mg/kg | 25/exposure level | Maternal toxicity (mortality, decreased body weight gain, and clinical signs) and developmental toxicity (increased incidence of minor skeletal variations and dilated lateral ventricles) were observed at 450 mg/kg. | This study (deve toxic level evide mate) |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Animals/ exposure level | Response | Study end exam- |
|---------------|------------|---|-------------------|-------------------------|------------------|------------------------------|---------------------------|----------------------------|--|----------------------------------|
| p-Cresol | 106-44-5 | Developmental toxicity | Rabbits | Oral | Gavage | Daily on gestation days 6-18 | 0, 5, 50, and 100 mg/kg | 14/exposure level | Maternal toxicity (mortality, audible respiration, ocular discharge, and hypoactivity) were observed at 50 and 100 mg/kg; no developmental toxicity was observed. | This study deve toxic level mate |
| m-Cresol | 108-39-4 | Developmental toxicity | Rats | Oral | Gavage | Daily on gestation days 6-15 | 0, 30, 175, and 450 mg/kg | 25/exposure level | Maternal toxicity (decreased body weight gain and food consumption, increased relative liver weight and clinical signs). No evidence of developmental toxicity was observed. | This study deve toxic level mate |
| m-Cresol | 108-39-4 | Developmental toxicity | Rabbits | Oral | Gavage | Daily on gestation days 6-18 | 0, 5, 50, and 100 mg/kg | 14/exposure level | Maternal toxicity (audible respiration and ocular discharge) were observed at 50 and 100 mg/kg; no developmental toxicity was observed. | This study deve toxic level mate |
| Cresol | 1319-77-3 | Developmental toxicity - Summary | | | | | | | | |
| o-Cresol | 95-48-7 | Reproductive toxicity | Minks and ferrets | Oral | Diet | ad libitum for 6 months | 0, 100, 400, and 1600 ppm | 4 males and 12 females | No birth defects or gross lesions of the adults were noted. | A de and I |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Animals/ exposure level | Response | Study Level |
|---------------|------------|-----------------------|---------|-------------------------|------------------|---|---------------------------|----------------------------------|--|---|
| o-Cresol | 95-48-7 | Reproductive toxicity | Rats | Oral | Gavage | Daily, 5 days/week for a 10-week pre mating period, 3-week mating period, gestation and lactation for 2 generations | 0, 30, 175, and 450 mg/kg | 25/sex/exposure level/generation | Parental toxicity (mortality, reduced body weight gain and food consumption, and clinical signs) were observed at 450 mg/kg; some clinical signs were observed at 175 mg/kg in the F ₁ generation only; no reproductive toxicity was observed. | This study reproduced toxic signs at parent level |
| m-Cresol | 108-39-4 | Reproductive toxicity | Rats | Oral | Gavage | Daily, 5 days/week for a 10-week pre mating period, 3-week mating period, gestation and lactation for 2 generations | 0, 30, 175, and 450 mg/kg | 25/sex/exposure level/generation | Parental toxicity (mortality, reduced body weight gain and food consumption, and clinical signs) were observed at 450 mg/kg; some clinical signs were observed at 175 mg/kg and higher in the F ₁ generation only; no reproductive toxicity was observed. | This study reproduced toxic signs at parent level |
| p-Cresol | 106-44-5 | Reproductive toxicity | Rats | Oral | Gavage | Daily, 5 days/week for a 10-week pre mating period, 3-week mating period, gestation and lactation for 2 generations | 0, 30, 175, and 450 mg/kg | 25/sex/exposure level/generation | Parental toxicity (mortality, reduced body weight gain, and clinical signs) were observed at 450 mg/kg; some clinical signs were observed at 175 mg/kg in the F ₁ generation only; no reproductive toxicity was observed. | This study reproduced toxic signs at parent level |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Animals/ exposure level | Response | Study reference | |
|---------------|------------|---|---------|-------------------------|---|----------|---|----------------------------|--|---|--|
| Cresol | 1319-77-3 | Reproductive toxicity by continuous breeding protocol | Mice | Oral | Dietary | 14 weeks | 0 or 0.25% (approximately 362 mg/kg/day); 1.0% (conversion not reported); and 1.5% (1682 mg/kg/day) | 40 breeding pairs/group | Treatment-related decreased body weight and feed consumption occurred at 16 weeks and thereafter in the F ₀ parents. High-dose parents also had increased kidney and liver weights. High-dose F ₀ males showed decreased epididymal and seminal vesicle weights, but no change in testis weight, sperm parameters, or testicular or epididymal histopathology. | Adequate | |
| Cresol | 1319-77-3 | Case reports (Russian study) | Humans | Occupational | Exposed to vanishes containing tricresol (mixed o-, m-, and p-cresol) | | Not reported | Not reported | Decreased adjusted live pup weight and number of live pups/litter (both sexes) were observed at high dose. No other effects were noted on reproductive indices. | | |
| Cresol | 1319-77-3 | Reproductive toxicity - Summary | | | | | | | Increased gynecological problems were reported (menstrual disturbances, hormonal disturbances, increased frequency of perinatal mortality, and increased abnormal development of newborns). | | |
| Cresol | 1319-77-3 | Pharmacokinetics - Summary | | | | | | | | A Russian report because the quantity was not available | |

Table of Toxicity Data for HAPs (continued)

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Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Response | Study location |
|-------------------------------|------------|---------------------|-----------------------|-------------------------|------------------|--------------------------------------|------------------------------|---|---|
| Epidemiology - Summary | | | | | | | | | |
| Hydrochloric acid | 7647-01-0 | Acute toxicity | Guinea Pigs | Inhalation | Head only vapor | 30 minutes | 320, 680, 1040, and 1380 ppm | 4 males/exposure in the two low exposure groups, and 8 males/exposure in the higher exposure group | There was a concentration response relationship for the onset of pulmonary irritation during exposure to CO ₂ challenge and pulmonary performance after exposure. There was morphological injury in the alveolar region. |
| Hydrochloric acid | 7647-01-0 | Acute toxicity | Baboons | Inhalation | Head only vapor | 15 minutes | 0, 500, 5000, and 10,000 ppm | 4 males/exposure level | Concentration related increase in respiratory rate and minute volume, transient breath holding at the higher concentration. Pulmonary functions were unaltered 3 days and 3 months post exposure. There was an increased frequency of response to a CO ₂ challenge 3 months post-exposure in the two high exposure groups. |
| Hydrochloric acid | 7647-01-0 | Acute toxicity | Rats (Sprague-Dawley) | Inhalation | Vapor | 6 hours/day, 5 days/week for 90 days | 0, 10, 20, and 50 ppm | 21-31/sex/exposure level | No a locat |
| Hydrochloric acid | 7647-01-0 | Subchronic toxicity | Rats (Sprague-Dawley) | Inhalation | Vapor | 6 hours/day, 5 days/week for 90 days | 0, 10, 20, and 50 ppm | Decreased body weight gain throughout study (but not at 90 days) at 50 ppm; dose-related rhinitis at all exposure levels. | The this be do sum was |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study identifier |
|-------------------|------------|--------------------------------------|--------------------|-------------------------|------------------|---------------------------------------|-----------------------|-------------------------------|--|---|
| Hydrochloric acid | 7647-01-0 | Subchronic toxicity | Rats (Fischer-344) | Inhalation | Vapor | 6 hours/day, 5 days/week for 90 days | 0, 10, 20, and 50 ppm | 21-31/sex/exposure level | Decreased body weight gain and liver weight at 50 ppm; dose-related rhinitis at all exposure levels. | The this be de because sum was |
| Hydrochloric acid | 7647-01-0 | Subchronic toxicity | Mice | Inhalation | Vapor | 6 hours/day, 5 days/week for 90 days | 0, 10, 20, and 50 ppm | 21-31/sex/exposure level | Decreased body weight gain and liver weight, and cheilitis with accumulation hemosiderin-laden macrophages at 50 ppm; eosinophilic globules in epithelial cells lining the nasal turbinates at all exposure levels. | The this be de because sum was |
| Hydrochloric acid | 7647-01-0 | Subchronic toxicity - Summary | | | | | | | | |
| Hydrochloric acid | 7647-01-0 | Chronic toxicity | Rats | Inhalation | Vapor | 6 hours/day, 5 days/week for 588 days | 0 or 10 ppm | 100/group | No effects were noted on survival or body weight. Respiratory effects included 81 animals with rhinitis (as compared to 72 in air controls), 62 animals with epithelial or squamous hyperplasia and 9 with squamous metaplasia. No other toxicity endpoints were reported. | In addition one was limit endpoint examined |
| Hydrochloric acid | 7647-01-0 | Chronic toxicity - Summary | | | | | | | | |

Adequate TSC

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study location/comp. |
|--|------------|---------------------------|--------------|-------------------------|------------------|---------------------------------------|--|-------------------------------|--|------------------------|
| Hydrochloric acid | 7647-01-0 | Carcinogenicity | Rats | Inhalation | Vapor | 6 hours/day, 5 days/week for 588 days | 0 or 10 ppm | 100/group | This interim report of a lifetime study did not find any nasal cancers in test animals. All 29 animals that spontaneously died or were moribund were necropsied and examined histologically. | Inadd one was |
| Hydrochloric acid | 7647-01-0 | Carcinogenicity | Rats | Inhalation | Vapor | 6 hours/day, 5 days/week for lifetime | 0 or 10 ppm | 100/group | This final report of the Albert et al. (1982) study. No nasal or other respiratory tract cancers were found in treated animals. The overall incidence of tumors in other organs was not increased in the 99 living test rats over those found in air or colony control groups. Respiratory effects included 81 animals with rhinitis (as compared to 72 in air controls), 62 animals with epithelial or squamous hyperplasia and 9 with squamous metaplasia. | Inadd one was |
| Hydrochloric acid | 7647-01-0 | Carcinogenicity - Summary | | | | | | | No a locat comp | This stand neuro test. |
| Hydrochloric acid (also CO and acrolein) | 7647-01-0 | Acute neurotoxicity | Rats Baboons | Inhalation | Vapor | 15 minutes | Rat: 11,800 to 87,660 ppm HCL Baboon: 190 to 17,290 ppm HCL | 4 to 6 rats; 6 baboons/group | No effect was noted on escape or avoidance of shock. | |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study |
|---|------------|---|-------------|-------------------------|----------------------------|-------------------------------|---|-------------------------------|--|----------------------------------|
| Hydrochloric acid (also CO and low O ₂) | 7647-01-0 | Acute neurotoxicity | Mice | Inhalation | Vapor via tracheal cannula | Approximately 5 to 15 minutes | 0 or 950 to 2150 ppm HCl | 8/test group | Concentration-related escape failure and incapacitation were seen in treated animals from 1095 ppm and higher. | This stand neur test, prot accep |
| Hydrochloric acid (also CO) | 7647-01-0 | Acute neurotoxicity | Guinea pigs | Inhalation | Vapor, whole body | <20 minutes | Approximately 100 to 600 ppm | 8/test group | Concentration-related incapacitation was noted in treated animals at all exposure levels. | This stand neur test, prot accep |
| Hydrochloric acid | 7647-01-0 | Neurotoxicity - Summary | | | | | | | | |
| Hydrochloric acid | 7647-01-0 | Developmental toxicity | Rats | Inhalation | Vapor | 1 hour/day, gestation day 9 | 0 or 300 to 600 mg/m ³ (0 or 134.1 to 402.4 ppm) | 8 to 32/test group | No mortality was observed in pregnant females in any group, but 7/32 non-pregnant females died (exposure level not specified). | Adequate locat |
| Hydrochloric acid | 7647-01-0 | Developmental toxicity - Summary | | | | | | | | |
| Hydrochloric acid | 7647-01-0 | Reproductive toxicity - Summary | | | | | | | | |
| Hydrochloric acid | 7647-01-0 | Pharmacokinetics - Summary | | | | | | | | |
| | | | | | | | | | | No d (TSC) |

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Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study |
|-------------------|------------|------------------------------------|---------|-------------------------|------------------------------------|----------------------------|---|---|---|
| Hydrogen fluoride | 7664-39-3 | Epidemiology (Case reports) | Humans | Inhalation | HF fumes and particulate fluorides | Several months to 2 years | Levels ranged from 0.27 to 4.1 mg/m ³ (0.3 to 5.0 ppm) | 207 workers | Respiratory impairment, paroxysmal wheezing in the chest, and dyspnea with objective signs of respiratory passage obstruction. |
| Hydrogen fluoride | 7664-39-3 | Epidemiology (Case reports) | Humans | Inhalation | Vapor | Not reported | Unknown, but 939 residents from the nearby community were examined in a hospital emergency room | Clinical signs of exposure (eye and skin irritation, throat soreness, chest pain, shortness of breath, cough, vomiting, dizziness, and headache) decreased forced expiratory volume, hypoxemia, and hypocalcemia were observed. | |
| Hydrogen fluoride | 7664-39-3 | Epidemiology (Case reports) | Humans | Inhalation | Vapor | Not reported | 4.5 to 25.9 years (76 % of workers had over 10 years of exposure) | 2.62 or 3.38 mg/m ³ (3.2 or 4.1 ppm) | 74 workers Increased bone density in workers exposed to 3.38 mg/m ³ , with respect to workers exposed to 2.62 mg/m ³ . |
| Hydrogen fluoride | 7664-39-3 | Epidemiology (Subchronic toxicity) | Humans | Inhalation | Vapor | 6 hours/day for 10-50 days | 1.16 to 3.88 mg/m ³ (1.4 to 4.7 ppm) | 5 subjects Irritation of the face nose and eyes; no systemic effects detected. | Irritation of the face nose and eyes; no systemic effects detected. |
| Hydrogen fluoride | 7664-39-3 | Epidemiology - Summary | | | | | | | Data possibly are n/a |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Response | Study endpoints/exposure level |
|-------------------|------------|--------------------------|---------|-------------------------|----------------------------------|---|------------------------------|--|---|
| Hydrogen fluoride | 7664-39-3 | Acute toxicity | Rats | Inhalation | Vapor either nose- or mouth-only | 30 minutes, followed by a 24-hour observation period | 0 or ~1300 ppm | 5-8 males/exposure level | This study demonstrated small and early changes in nasal, tracheal, and bronchial histopathology were observed. |
| Hydrogen fluoride | 7664-39-3 | Acute toxicity | Rats | Inhalation | Vapor (head only) | 60 minutes, followed by a 14 day observation period | Not reported | 4 males/exposure level | Respiratory distress, ocular and nasal discharges, corneal opacity, necrotic lesions of the eyes, face, and ears, and severe weight loss; 60-minute LC ₅₀ of 1630 ppm (humidity <10%) or 541 ppm (humidity 45%). |
| Hydrogen fluoride | 7664-39-3 | Acute toxicity - Summary | | | | | | | |
| Hydrogen fluoride | 7664-39-3 | Subchronic toxicity | Rats | Inhalation | Vapor | 5 hours/day (number of days/week not reported) for 3 months | Not reported | 10 controls, 20 experimental (divided among an unreported number of exposure groups) | Histological examination revealed liver necrosis and emphysema. Changes in enzymatic activities were observed in liver, heart, lung, and stomach tissues. |
| Hydrogen fluoride | 7664-39-3 | Subchronic toxicity | Rats | Inhalation | Vapor | 6 hours/day for 14 days | 0, 1, 10, 25, 65, or 100 ppm | 5 males and 5 females group | All males above 25 ppm and females above 10 ppm died. There was marked body weight loss at 10 ppm and above, and an increase in lung to body weight ratio in all animals that survived and in kidney to body weight ratio in survivors at 10 ppm and above. |
| | | | | | | | | | Additive hydrofluoride report |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study |
|-------------------|------------|--------------------------------------|-------------|-------------------------|------------------|----------------------------|---|-------------------------------|--|---|
| Hydrogen fluoride | 7664-39-3 | Subchronic toxicity | Guinea pigs | Inhalation | Vapor | Continuously for 96 hours | 7 mg/m ³ (8.6 ppm) (pre-treatment measurements served as control values) | 7-9 males | Increased plasma cAMP, total cholesterol, and non-esterified fatty acids. | This inad- assess toxic only of en exam sex, durat expo |
| Hydrogen fluoride | 7664-39-3 | Subchronic toxicity | Guinea pigs | Inhalation | Vapor | Continuously for 84 hours | 0 or 10 mg/m ³ (0 or 12.2 ppm) | 12 males | Increased total cholesterol and triglyceride levels; inhibition of extrahepatic lipoprotein lipase activity. | This inad- assess toxic only of en exam sex, durat expo |
| Hydrogen fluoride | 7664-39-3 | Subchronic toxicity - Summary | | | | | | | | |
| Hydrogen fluoride | 7664-39-3 | Chronic toxicity | Guinea pigs | Inhalation | Vapor | Continuously for 18 months | 0 or 150 µg/m ³ (0 or 0.2 ppm) | Not reported | Alterations in cholesterol enzymes systems. | Older seven Battie subcl |
| Hydrogen fluoride | 7664-39-3 | Chronic toxicity - Summary | | | | | | | | Addi- hydr |
| Hydrogen fluoride | 7664-39-3 | Carcinogenicity - Summary | | | | | | | | No d (Cle) |
| Hydrogen fluoride | 7664-39-3 | Neurotoxicity - Summary | | | | | | | | No d (Cle) |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Study location |
|---|------------|---------------------------------|---------|-------------------------|------------------|--|---|-------------------------------|---|
| Developmental toxicity - Summary | | | | | | | | | |
| Hydrogen fluoride | 7664-39-3 | Reproductive toxicity | Rats | Inhalation | Vapor | Administered for 7 weeks prior to pregnancy and during pregnancy and lactation, followed by exposure of offspring for 1-6 months | 0, 2.75, or 4.99 mg/m ³ (0, 3.4, or 6.1 ppm) | Not reported | Decreases in serum and urine levels of hydroxyproline and hydroxylsine in offspring |
| Hydrogen fluoride | 7664-39-3 | Reproductive toxicity - Summary | | | | | | | Additive hydro |
| Hydrogen fluoride | 7664-39-3 | Pharmacokinetics - Summary | | | | | | | Information of int (Cle mech 1991) |

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Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Response | Study reference |
|-------------------------------|------------|-------------------------------|---------------|-------------------------|------------------|---------------------------------|----------------------------|--|---|
| Chlorine | 7782-50-5 | Epidemiology (Case reports) | Humans | Inhalation | Occupational | "Chronic" (not quantified) | <1 ppm | Not reported | Reduced maximum midexpiratory flow. Unpublished data. |
| Chlorine | 7782-50-5 | Epidemiology (Acute toxicity) | Humans | Inhalation | Not reported | Not reported | Not reported | Fatal exposure produces inflamed bronchi, pulmonary edema and foci of bronchopneumonia; nonfatal acute exposure produces shortness-of-breath, coughing, blood in respiratory secretions, tightness of the chest, cyanosis, conjunctivitis, headache, nausea, vomiting, and respiratory distress. | |
| Epidemiology - Summary | | | | | | | | | |
| Chlorine | 7782-50-5 | Acute toxicity | Mice | Inhalation | Gas | 6 hours/day for 5 days | 0 or 9.34 ppm | 16-24/exposure group (sex not reported) | Exposure resulted in severe ulceration and necrosis of both the respiratory and olfactory epithelium, and severe exfoliation and erosion of the respiratory epithelium. |
| Chlorine | 7782-50-5 | Acute toxicity | Rats and mice | Inhalation | Gas | 6 hours/day for 1, 3, or 5 days | 0 or approximately 9.1 ppm | 9-10/exposure group and 5-7/ control group | Severe lesions were found in nasal passages and there was acute degeneration of respiratory epithelial cells. |
| Additive regarding TSC. | | | | | | | | | |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study information |
|---------------|------------|---------------------------------|-------------------------|-------------------------|------------------|---|--------------------------|---|---|---|
| Chlorine | 7782-50-5 | Acute toxicity | Rats, mice, and monkeys | Inhalation | Gas | 1 year for monkeys and 2 years for rats and mice | Not reported | Not reported | The were increased numbers of nasal mucous cells in rats and mice. The response of the monkeys consisted of small foci of respiratory epithelial hyperplasia with no increase in mucous cells. | This contains information of exposure of the monkeys. |
| Chlorine | 7782-50-5 | Acute toxicity - Summary | | | | | | | | |
| Chlorine | 7782-50-5 | Subchronic toxicity | Rats | Inhalation | Gas | 6 hours/day, 5 days/week, 6 weeks | 0, 1, 3, and 9 ppm | 10/sex/day | Treatment-related decreased body weight gain and lung lesions (all exposures) and hepatic and renal effects at 3 ppm and higher; 3 high-exposure females died; increased hematocrit and white blood cell count 9 ppm females; altered blood chemistry and urinalysis. | In addition to the study of exposure of the monkeys. |
| Chlorine | 7782-50-5 | Subchronic toxicity | Rats | Inhalation | Vapor | 6 hours/day, 5 days/week for 62 exposure days (approximately 90 days) | 0, 0.5, 1.5, and 5.0 ppm | 32 males/group and 5 females (used only for clinical signs and growth determinations) | Severe clinical signs of eye and upper respiratory tract irritation were observed in the 5.0 ppm group, while less severe signs were reported for the 1.5 ppm group. Weight gain was decreased in females of all groups and in males of the high dose group. In the 1.5 and 5 ppm groups, there was an increase in collagen content of the lungs and loss of cilia and focal erosion of tracheal epithelia. | In addition to the study of exposure of the monkeys. |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study Type (AW) |
|--------------------------------------|------------|----------------------------|---------|-------------------------|------------------|---|--------------------------------|-------------------------------|--|--|
| Subchronic toxicity - Summary | | | | | | | | | | |
| Chlorine | 7782-50-5 | Chronic toxicity | Monkey | Inhalation | Gas | 6 hours/day, 5 days/week, for 12 months | 0, 0.1, 0.5, or 2.3 ppm | 4/sex/exposure group | The only effect observed was mild hyperplasia (with loss of cilia and goblet cells) of the nasal mucosa in the high exposure group with trace lesions reported in all females and mid-exposure males. There were similar lesions in the trachea of females in the high exposure group. | Inadequate of the size; external histopathology examined perifollicular. |
| Chlorine | 7782-50-5 | Chronic toxicity - Summary | | | | | | | | |
| Chlorine | 7782-50-5 | Carcinogenicity | Rats | Oral | Drinking water | 7 generations (not described further) | 0 and 100 mg/L (0 and 100 ppm) | 237 total animals | Increased number of ileocecal sarcomas in the F ₂ generation exposed rats, but not in subsequent generations. | Inadequate |
| Chlorine | 7782-50-5 | Carcinogenicity | Rats | Oral | Drinking water | 104 weeks | 0, 70, 140, and 275 ppm | 70/sex/group | The incidence of mononuclear cell leukemia was significantly greater in mid-dose females ($P = 0.014$) but not high-dose females; histopathology results in males did not differ from controls. | Adequate |
| Chlorine | 7782-50-5 | Carcinogenicity | Mice | Oral | Drinking water | 104 weeks | 0, 70, 140, and 275 ppm | 70/sex/group | No increased incidence of tumors was noted in treated animals of either sex. | Adequate |

Table of Toxicity Data for HAPs (continued)

| Chemical Name | CAS Number | Study Type | Species | Route of Administration | Type of Exposure | Duration | Exposure levels | Number studied/exposure level | Response | Study information |
|---------------|------------|----------------------------------|---------------|-------------------------|------------------|--|---|----------------------------------|--|--|
| Chlorine | 7782-50-5 | Carcinogenicity | Rats and mice | Inhalation | Vapor | Mice and male rats 6 hours/day, 5 days/week, and female rats 6 hours/day for 3 alternate days/week for 2 years | 0, 0.4, 1.0, or 2.5 ppm | 70 males and females/groups | There was no increase in neoplastic lesions as compared to the controls. There was a dose-related increase in degenerative lesions of the nose. Chlorine-induced respiratory epithelial hyperplasia, respiratory and olfactory epithelial degeneration, septal fenestration, and mucosal inflammation of the anterior nasal cavity were noted. | This is an adjuvant carcinogen study document available. |
| Chlorine | 7782-50-5 | Carcinogenicity - Summary | | | | | | | | Adequate information is available. |
| Chlorine | 7782-50-5 | Neurotoxicity - Summary | | | | | | | | Neurotoxicity (AW) |
| Chlorine | 7782-50-5 | Developmental toxicity - Summary | | | | | | | | Developmental toxicity (chlorine) |
| Chlorine | 7782-50-5 | Reproductive toxicity | Mice | Oral | Drinking water | 6 months | 10 ppm residual chlorine and enough hydrochloric acid to maintain a water pH of 2.5 | Not reported | No adverse reproductive effects. | Inadequate information is available. |
| Chlorine | 7782-50-5 | Reproductive toxicity | Rats | Inhalation | Vapor | 6 hours/day, 5 days/week for 62 exposure days (approximately 90 days) | 0, 0.5, 1.5, and 5.0 ppm | 8 males and 10 females per group | No effects were observed when exposed males and females were mated with unexposed animals of the opposite sex. | Inadequate information is available. |

Table of Toxicity Data for HAPs (continued)

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